THE

AMERICAN NATURALIST

VOL. XXVIII. May, 1894. 329

REMARKS ON SCHULZE'S SYSTEM OF DESCRIPTIVE TERMS.[1]

BY ALPHEUS HYATT.

One cannot systematically describe a number of species or in fact properly record observations especially upon isolated species or groups without the aid of a convenient nomenclature and a generalized, topical scheme of work. The invention of such a system obliges one to make a more or less complete classification of the parts of any form, and this is a most efficient aid to thorough observation and a check upon hasty, inconsequent or unsystematic description.

Such remarks are apparently superfluous and even supercilious, but no one can work with new methods or try to find in scientific literature reliable data with regard to any of the invertebrates without being continually confronted with positive evidence that in the effort to place new species on record, many naturalists have lost sight of the main aim of descriptive work. The fixed habit of considering a new species as a discovery of such importance, that the describer's name must forever remain attached to it, is perhaps necessary, but it has loaded scientific research with an enormous mass of badly constructed records.

[1]This paper with the exception of the introductory remarks was published in Biologisches Centralblatt, XIII, Nos. 15-16, August, 1893, as Bemerkungen zu Schulze's System einer deskriptiven Terminologie. It has been thought advisable to have it published in English.

One of the most remarkable characteristics of the literature of this century in zoölogy and paleontology is the great contrast between the careless, inadequate, descriptive text of many large costly works and the excellent plates and other accompanying illustrations. There are a number of these books in which there is a wide difference between the scientific record made by the author and his artistic efforts or those of his draughtsman, the former being often inconsequent and unworthy of companionship with the latter. I refrain from giving examples for the simple reason, that they are within the experience of every student, and there would be no compensating advantage in exciting useless antagonisms. An attempt to construct a properly systematized topical scheme of work would have forced such authors to name and describe most of the principal regions and parts of the anatomy and to follow out a similar scheme in the description of each species, thus minimizing the irregularity and vexatious incompleteness of their observations.

One of the marked characteristics of the day in natural science is the effort to give greater accuracy to descriptive nomenclature. Professor B. G. Wilder[2] was the pioneer in America, and although his efforts were for many years unappreciated, they are now beginning to bear fruit. Wilder and Gage's Anatomical Technology (1882) laid the foundation of the movement which has just been reinforced in Germany by a very able paper from Franz Eilhard Schulze[3] in which he lays down some general principles for the construction of terms that ought to be carefully read by every naturalist.

The details of his scheme are in brief as follows:

He divides organic bodies into; (I) die Synstigmen, Centrostigma of Haeckel (*στιγμα* meaning point) having a single imaginary centre to the body. This point he proposes to call "centrum," parts in the centre "centran," approximate parts are "central" or "proximal," those which lie toward the cen-

[2]A partial revision of anatomical nomenclature, with especial reference to that of the brain. Science, II, 1881, pp. 122–126. 133–138.

[3]Bezeichn. d. Lage u. Richtung im. Thierkörper. Biol. Centralb., XIII, No. 1, 1893.

tre "centrad" or "proximad," those lying away from the centre "distal" or "distad," parts external or on the periphery "distan." Any part at right angles to the imaginary radii of the body or to the surface, he proposes to call "tangential" as long as they are external or "paratangential," when they are internal. Thus there may be tangential parts or distan, distal, proximal and central, paratangential parts, and they may be distal from the centrum or proximal when not central or centran.

Professor Simon Gage of Cornell in a letter to Dr. Wilder comments upon the use of "centran" as follows. "One of Schulze's principal points over what is ordinarily given is the suggestion of the termination "an" for the absolute centre, ventral surface, dorsal surface or aspect, etc. Barclay in his book, pp. 168–173, considers this and uses for this purpose the ending "en" as "centren, dorsen, dextren, sinistren," etc.

"The natural development of these ideas would have been to make a distinction between internal and external, using the termination "an" for internal parts which are centran or axian and leaving "en" for the designation of such as are peripheral. It is, however, evident as suggested by Dr. Wilder, that the termination "en" is more suitable for the designation of internal parts, on account of its derivation and common use, whereas "an" is in line with the terminations "al," "ad" and not in conflict with usage. It seems to me that Schulze is not wholly consistent in his use of the termination "an," and that following Wilder's suggestion, it would be much better to say centren and use centran for any external points which might be established in the polar axis of the body."

The class of bodies referred to as Synstigmen are to be found exclusively among Protozoa or their corresponding cellular elements among Metazoa, and Schulze's term is defective in that it takes no notice of the large numbers, especially among Infusoria, which have a spiriform arrangement of parts or of the entire body, often also more or less complicated with bilateral asymmetry.

Although it is obviously desirable that the assumption of an imaginary centre should be made in cases which have no

organic centrum, it will be considered questionable in the description of tissue cells or the bodies of the Protozoa, whether the nucleus should not be considered as the centrum. Schulze thinks that in such cases a distinction should be made and an additional compound term framed which would express the difference between the artificial and natural points or axis, etc. Thus the nucleus would be the "nucleo-centrum" however excentric its position. Undoubtedly in this, as in other cases, it is of advantage to make comparisons between the imaginary morphic centre and the organic centre, since while these are often the same they are not coincident in many forms and the use of a double set of terms will oblige observers to note such phenomena in their descriptions. Nevertheless one cannot say without experience in practical application whether a double set of terms would be advantageous or merely burdensome. (2). Die Syngrammen (γεαμμη meaning line) the Centraxonia of Haeckel, bodies elliptical cylindrical, etc., pyramidal, etc., which may be considered as having their parts arranged around an imaginary central axis but having all sides equal. This axis he calls "principal axis" both ends are styled "termini," the surfaces immediately around the termini are "terminan" and the direction toward them "terminad."

Centrum, centran, centrad, are used as before for parts lying in the principal axis or in that direction. "Axian" is employed for parts in the principal axis, when near to that line "proximal,"[4] when directed toward it "axiad," the region away from the principal axis is "distal," the direction is "distad" and the surface or periphery is "distan."

All planes or parts lying in planes going through the principal axis are "meridian," all parallel with these "parameridian." The parts lying in the plane passing through the centre at right angles to the principal axis are "transversan," and

[4]The use by Schulze of "proximal" as a synonym for "central" is open to serious objection. Proximal, proximad as synonyms of central, centrad, are not essential to his scheme, and these words are already in use as general descriptive terms applicable to any neighboring parts. It is, therefore, obviously disadvantageous to try to give them a more restricted meaning. The restriction of distal, distad, distans, to the body has similar objections and is not sustained by usage.

the planes parallel to this are "paratransversan." If the suggestion were adopted, all parts lying internally in these planes would be meridien and transversen, and the points on the periphery also in these planes would be meridian and transversan.

He intimates that there are oral and "aboral" planes in the paratransversan planes, but does not advocate the use of the terms oran, orad, and aboran and aborad as desirable for those bodies having the mouth in what may be called the terminan paratransversan plane, and the anus or base in the opposite plane.

Among Porifera one can assume a central axis, and it is possible to distinguish the oral and aboral ends or what may be considered as corresponding to them, the excurrent apertures (or so-called oral openings) and the attached base. But the incurrent apertures, the digestive sacs, the tissues and the spicules of the skeleton are normally arranged in concentric layers, which cannot be referred to any system of imaginary planes parallel with the principal axis. There is in these forms no organic element by which a meridian plane can be determined, they are exclusively concentric.

The same remarks apply also to the Hydrozoa and Actinozoa and more or less to all of the animals included under the old term, Radiata, whose parts are normally arranged in concentric layers cut by radiating lines and planes. If Schulze's system had taken note of such general morphic characters it would have been more complete. The meridian plane can be organically determined in most of these organisms, but this primitive division of the body is not carried out in the structures of the sides, these have no organic lateral parts which can be advantageously compared with any supposed parameridian planes. They and the tissues of the body all lie in concentric tubular conical or spherical surfaces secondarily intersected by radiating lines and planes. Schulze's system of planes takes no notice of these facts, but his meridian and transversan planes can be used with advantage to indicate the existing bilateral elements in these structures. The main objection to his system appears to be that it is better fitted for use among

"Bilaterien," that is for Mollusca, Worms, Myriapods, Insects and especially Vertebrates, than for the simpler organisms Protozoa, Porifera, Hydrozoa, Actinozoa, in which this element of symmetry is absent or more or less obscured.

Professor Wilder has already used "peripherad" as the antithesis of "centrad" and according to Schulze's system peripheran could be used for the distan surface in general. Thus the mesenteries of the actinozoa extend peripherad from the principal axis or the median plane.

It is also questionable whether a good topical classification of such animals as Actinozoa and Echinodermata ought not to recognize an intermediate region between the central and distal regions. There would be just as great a difficulty in defining a central region and a distal or peripheral one as in limiting the use of these terms to two regions separated by a third, which might be termed the extra-central with reference to the axis or extra-median when used with reference to the corresponding plane.

(3). "Die Sympeden oder Bilaterien," Zeugiten oder Centrepipden of Haeckel. These bilateral bodies have three axis. The "perlateral" axis is described as "isopolar" by Schulze, probably in allusion to the organic similarities of its poles. "Equiradial" would be equally good description on account of the equal lengths of the radii of the axis. The other is the dorso-ventral axis and is what he calls "heteropolar" and this is apt to be also inequiradial. The principal axis is the longitudinal axis, also described as "heteropolar" and apt to be also inequiradial, estimating from the supposed organic centrum. All in the principal axis is "axian," the neighborhood is "axial," the direction "axiad," or one may also use proximal, proximad, farther from it everything is "distal," and the direction away from this axis is "distad."

The two ends of the principal axis are respectively "rostral" instead of "cephalic" or "oral" or "proral" (Prora, prow of a vessel) and the tail end or the other end, whether distinguished by a tail or not, "caudal" instead of "aboral."[5]

[5] Schulze subsequently gave his nomenclature with illustrative figures in Verhandl. d. Anat. Gesellsch., May 1893, and Verhandl. d. deutsch. Zool. Gesellsch., May 1893. In this paper and in the discussion following this last a

The surface of the rostral end is "rostran" and the surface of the caudal end is "caudan." The direction toward these are respectively "rostrad" and "caudad."

In a letter from Prof. Gage to Dr. Wilder which has been forwarded to me, the former very justly observes that "Schulze discards 'cephalic' although he adopts caudal. Cephalic is certainly a more natural opposite of caudal than is rostral, the word he proposes in its place. Then cephalic has been and is used a great deal in English and considerably in German, and the use is increasing."

The main objection to this in my opinion, is that it applies to the vertebrata better than any other type and fails with the simplest forms of these. Among Ascidia, for example, there is perhaps a rostral extremity, but there is no caudal extremity in the adults. There is an aboral region, but the oral region is central or centran. While one therefore might make rostral, rostran and rostrad work well, some other term than caudal should be employed for the opposite pole. It seems contrary to all rational usage to employ terms having a definite meaning like cephalic and caudal to bodies that have no head, nor representative oral opening, and no tail.

Whenever in bilateral animals the mouth is at the extreme pole of the principal axis, I can see no objection to the use of oral, oran, orad, but when it is not there rostran, rostral and rostrad are highly appropriate. When the mouth is external and ventran, or lies out of the principal axis on any surface, as it is in a number of types, additional accuracy may possibly be given to the terminology if both rostral and oral planes or regions were recognized. At any rate this suggestion might be tested.

Schulze uses "dorsal" and "ventral" for the entire halves of the body respectively, the extreme surfaces are "dorsan" and "ventran," the direction toward them "dorsad" and "ventrad." The perlateral axis has "dextral" and "sinstral"

number of other terms synonymous with rostral and caudal, viz. atlantal and sacral, oral and aboral, proral and prymnal, actinal and abactinal were brought forward, even "Alpha ende" and "beta-ende" and the accompanying "alphal, alphan, alphad," "betal, betan, betad" were proposed for the two ends of the principal axis in bilateral animals.

halves, the ends are "dextran" and "sinistran,"[6] the direction toward them "dextrad" and "sinistrad."

The intersection of the axis is as before "centrum," the neighborhood "central," the direction "centrad." All the parts lying in the imaginary plane passing through the principal and ventro-dorsal axis are "median," the neighborhood is "medial," the more distant region on either side is "lateral." The direction toward the median plane is "mediad," direction toward the side is "laterad." Medial does not appear to be any improvement upon Barclay's term "mesial" or Wilder's modification "mesal" for the same plane. The latter in fact is preferable both on account of prior use and brevity. The extreme outer lateral parts or surfaces are "dextran" and "sinistran" like the ends of the axis, the direction toward these "dextrad and "sinistrad." Thus the two halves of the body are dextral and sinistral but the hands and feet are dextran and sinistran, the arms and legs extended dextrad and sinistrad of the dextran and sinistran surfaces of our bodies, and the right elbow is dextrad of the shoulder but mediad of the wrist.

This statement according to Wilder and Gage should be that "the right elbow is distad of the shoulder but proximad of the wrist," mediad and mesal being restricted to the trunk or used only for the general statements with regard to the limbs. Usage derived from Barclay would apply proximal and distal wholly to the appendages, distal being toward the free end and proximal at or toward the attached end. Wilder and Gage use these terms in this restricted sense and Comstock gives them an identical meaning. Butschli in the discussion quoted above in note also maintained that these terms should be applied only to appendages and parts outside of the mass of the body. That Schulze had no such limitations in mind when framing his terms seems to be settled by his suggestion to use proximal as a synonym for central, and

[6]Wilder and Gage use the term "aspect" in the same sense as Schulze words ending in "an," or Barclay's ending in "en"; thus there is the cephalic aspect and ventral dorsal, lateral and sinistral aspects. The strongest objection to these terms is the fact that they are not mononymic, whereas Schulze's terms fulfil this requirement.

his application of distans to the peripheral parts and the similar use of terms ending other in " an."

Comstock in his " Guide to Practical Work in Entomology"[7] says that dorsad, ventrad, cephlad, etc., indicate direction in parallel lines having infinite extension. " In other words these terms must be used in a way analogous to that in which we use right and left." Lines which converge according to small explanatory wooden model kindly sent me by Prof. Wilder, are described by him as " caudo-laterad " when directed from the head end to the sides, cephalo-mesad when in the opposite direction, " dorso-latero-cephalad " when diverging from the caudal extremity toward the dorsum and side and so on.

The plane passing through the principal and perlateral axis is termed by Schulze the " frontal " plane (a poor word as acknowledged by Schulze). This divides the ventral from the dorsal regions, but Schulze seems to get into trouble here and omits the usual list of terms for neighborhood. These must be dorso-frontal and dorso-frontad, very awkward terms and about as inconvenient as ventro-frontal or ventro-frontad, but dorsan, dorsad, and ventran, ventrad for the outer parts, come into line again without difficulty. It would appear more natural to designate this as the perlateral or lateral plane or the tergo-frontal plane. This would enable one to designate the neighborhood on either sides as frontal and tergal and the directions toward the plane as frontad and tergad, any part in the plane itself would then be tergo-frontans or frontens, etc. Tergo-frontal would not interfere with the normal use of these terms on either side of it and be also in accord with dorsal, dorsad and ventral, ventrad, for the ventral and dorsal regions respectively, and would designate the duplex relation of this plane passing as it does between two distinct regions of the body.

The third plane passing through the dorso-ventral and perlateral axis, is the " transversal " dividing the rostral from the caudal regions of the body; the parts lying in this plane are " transversan " and the direction " transversad "; rostral, ros-

[7] Ithaca, University Press, 1882, p. 9.

tran, rostrad, caudal, caudan and caudad also work well for the remoter parts. All planes lying parallel to any of these within the body are distinguished by the prefix "para."

Wilder and Gage have already recommended and now habitually use many of the terms also adopted by Schulze, but their system was tentative and did not aim at completeness. They, however, have used effectively "ental" and "ectal" terms not noticed by Schulze. Thus "the dura (mater)" is "ectad" of the brain but "entad" of the cranium. A part may be divided by cutting either ecto-entad or ento-ectad." There is also another application of words derived from ἐχτος and ἐντός which seems an obvious advantage. Ectal, ectans and ectad can be of great use if limited exclusively to parts that protrude from the surface of the body, like the appendages in Vertebrata, Crustacea, the spines of Echinoidea, the arms of Crinoidea, the tentacles of Actinoza and the like. Parts that stand out from the distan or terminan, rostran or caudan, dorsan or ventran surfaces of the body. If this were done the limbs would all be described as ectal of dextran and sinistran surfaces, the articulations of the body would be "ectad" or "entad" of those surfaces or their origin, if penetrating deeper might be designated by an appropriate term according to the topical terms already employed, central, proximal or distal. All the minor divisions of the ectal parts could then be referred to the surfaces of the body. Thus the bases of the spine in Echinus would be ectad of the body but proximad of its surface, while the termination would be distan with relation to the same surface, and it would have its own centrum and central region, principal axis, and so on.

In applying these words to a deeper seated part as to the radiating spines of Radiolarian or the threads of the stalk of a Hyalonema the use of "ental" to designate the part inside of the distan surface of the body would not entail confusion, since it would be used in direct connection with the description of the spine or threads. The stalk of Hyalonema in the most complicated example would be ental in origin, arising in the distal. It would be better to say the oral or actinal part of the central axis, pass through the centrum and

aboran regions and extend ectad, spreading out during its progress into a support suitable to anchor the body of the sponge in the mud below. The spines of Xiphacantha would be ento-ectal (extending from the centrum to the distans[7] surface and then ectad) having their origin in a central mass, possessing radiating spines on the distan surface and passing ectad of these to a variable distance.

Professor Gage objects to this in the following words "It seems to me the suggestions with reference to ectal, etc., are not happy. Proximal and distal seem to me to express nearness and remoteness of appendages to the part from which they arise. That may be reference to a limb or the trunk taken as the origin. For example, the arms and legs are appendages of the trunk, their distal ends being the hands and feet and the attached ends the proximal. So just as properly, in accordance with the established use of proximal and distal, the attached end of the hair is its proximal end while the free end is distal. This is true whether the hair is on the trunk or an appendage. I think the use originally made of ectal and ental by yourself (Wilder) the best one, the fundamental idea is in the compounds Ectoderm and Entoderm."

These criticisms coming from such a source and appealing to the derivation of the words are consistent with the Barclayan system and would be very convincing but for one thought that makes me hesitate to abandon this suggestion until I can learn more from experience. If the terms ectal and ental are to be applied to parts without reference to their origin, but simply because they are external and internal, it is obvious that they cannot be restricted any more than the words, outside and inside. If one is describing a spine or appendage of any sort the surface is ectal, the inner part ental, but if one is describing the body with reference to its appendages, the spines are ectal or they may have parts within the body and these are ental. The limbs of the Vertebrata and Crustacea may be considered either with reference to the surface of the body or to the skeleton, but the stalk of a hyalonema and the spine of Radiolarian may originate from the centrum itself.

[7] A better word here is peripheran.

THE SCOPE OF MODERN PHYSIOLOGY.[1]

By Frederic S. Lee.

A review of the present aspect and tendency of a rapidly growing science in the light of its history may not be without profit. It may help to clearer vision and more exact orientation; and it may direct and stimulate investigators. These thoughts, together with the prevalence of an apparent misconception regarding the true aim and scope of Physiology, have led to the following paper.

To one who is acquainted with modern biology, it will seem unnecessary to repeat that physiology is the science of function or action; that it is to be contrasted with morphology, the science of form or structure; that these two form the grand divisions of the science of living things, or biology; that, just as there is an animal and a vegetable biology, so there is an animal physiology and a vegetable physiology; that, further, every species has its physiology; that every portion of living matter, be it organism, organ, tissue, cell, or simplest group of molecules deserving the name protoplasm, Weismann's biophor, has its physiology; that, for whatever functions or acts, there must be possible a science of function or action. All this seems self-evident and trite to the biologist. By the non-biologist its truth is being overlooked constantly. To him, forgetting that botany and zoology exist, the term physiology means merely *human* physiology, a most narrow significance and one that is productive of evil results. Undoubtedly the animal physiologists themselves have been responsible, unintentionally and unwittingly, for this common and radically false notion of the relatively narrow field of their science. In their zeal to penetrate the mysteries of that most wonderful and most interesting of all protoplasmic structures, the human body, and in their desire to perfect a strong foundation

[1]Read before the Section of Biology of the New York Academy of Sciences, November 20, 1893.

for the science and art of medicine, it was to be expected that their investigations should have an "anthropocentric" bias and that physiology and medicine should be born and grow old together. Let a union so intimate be once established, let centuries of tradition surround and strengthen it and the separation is not an easy process. With special reference to this question and at the risk of treading upon well-known historic ground, what has been in brief the history of animal physiology?

It is convenient to divide it with Preyer into five periods; the first four ending approximately with the dates 350 B. C., 160 A. D., 1628, and 1837 respectively, the fifth extending to the present time. The last four periods are characterized by one or more prominent investigators, the second by Aristotle, the third by Galen, the fourth by Harvey and Haller, the fifth by Johannes Müller.

The beginnings of animal physiology were contemporaneous with the speculations of the earliest natural philosophers and the labors of the earliest physicians. In Egypt, in China, in India, in Greece, the origins of the science are necessarily indefinite and, with the help of occasional fragments of historical fact, must be left to our imagination. The inclination toward self-study is an innate human characteristic and the more obvious facts of man's bodily functions could scarcely have failed of notice. Something was doubtless learned from the bodies of men killed or wounded in battle, and from the slaughter of animals for food. More precise observations were made upon sacrificial animals for purposes of divination. But facts thus obtained were necessarily isolated, and abundant speculation was the distinguishing characteristic of the whole period. From its shadowy beginnings down to the death of Hippocrates and Plato, the theories that were held regarding the origin and nature of life, unsupported, as they were, by observation and experiment, could not establish a science of vital action. Even Hippocrates himself, skillful as he was in the treatment of diseases, was no physiologist.

At the beginning of the second period was Aristotle, the first systematic observer of natural phenomena. His knowl-

edge of physiological fact was derived, as is well known, in greatest part from his own observations on man, the lower animals, and plants; and to a large extent it forms the basis of all subsequent development of the science. His pupil, Theophrastus, founded the science of vegetable physiology. Contemporaneous with Theophratus was the development of the great school of medicine at Alexandria, and here, under Herophilus and Erasistratus, animal physiology, along with anatomy and pathology, as a part of medicine undoubtedly made great progress. The extent of .that progress can be inferred only imperfectly from later writers. The loss of the Alexandrian records is most lamentable. Aristotle had dissected animals; the Alexandrians dissected the human body and, more important for our science if true, it is possible that they performed experiments on animals. The facts made known by Aristotle were added to; physiological material accumulated. Thus, while the first period had been speculative, the second was descriptive. But not yet was there a *science* of function.

Then came Galen, the great physician, investigator, and writer, and it was he who organized the mass of knowledge that through the centuries had been growing. From Galen's time animal physiology has had a recognized position as a branch of natural science. A modern writer[2] says of him: "In the midst of contending factions he alone and for the first time shaped physiology into an independent science. He established physiology as the doctrine of the use of organs; he experimented upon animals * * *; and he suggested questions which he answered by the aid of such experiments. In opposition to all his predecessors and contemporaries, he maintained physiology to be the foundation of medicine. Further, he, first of all and so far as it was possible at his time, described and explained the functions methodically and completely. Upon the one side he sought to refer vital phenomena to natural causes, and upon the other he lauded their purposeful character, with expressions of admiration for the wisdom of the Creator, while their fitness aided him in explain-

[2]Preyer, *Allgemeine Physiologie.*

ing them. * * * The fact that the Galenic physiology, where-ever it was known, prevailed for fifteen hundred years is due to its two-sided development. For physicians accepted it because of its materialism, and the clergy because of its teleology. Since Galen was an extraordinarily sagacious thinker, an uncommonly learned man, an industrious, systematic, truth-loving worker and skillful physician, never neglecting practice for research nor research for practice, of all the medical fraternity he seemed best fitted to lay the corner-stone of physiology as a science in itself. And it testifies to his genius that, in the whole thousand years following him, Galen's physiological system, constructed through his originality and the power of his logic, endured as law, seriously opposed by no one. The history of no science can show the like. Faith in the authority of Galen's name finds its equal only in the history of religions." It is to Galen's influence, doubtless, more than to that of any other, that the intimate union of physiology and medicine, continuing even to the present day, is due. And to him likewise we must ascribe the present prevailing idea, already spoken of, of the essentially human character of the science. Galen's physiology was in essence a human physiology; and the new science fully born became the handmaid of medicine. Galen's authority was supreme until the age of the Renaissance, and throughout the long mediaeval period animal physiology was at a standstill. Toward its close the Italian universities were established and men began to think for themselves, to read nature in addition to the books, and gradually to learn that nature and Galen did not always agree. The elaborate and ill-founded hypotheses of the spirits, the elements, the qualities, and the humours did not accord with the progressive, investigating spirit of the Renaissance and rebellion against the master gradually grew in strength. Paracelsus burned in public at Basel the works of Galen. More destructive than fire were the anatomical investigations of Vesalius and Fallopius. And in physiology Colombo and Caesalpinus prepared the way for the most important single discovery of the times. This event, which more than all else demonstrated the ineffectiveness of pure speculation and the

need of a rational method of observation and experiment, was none other than the discovery of the circulation of the blood.

With the announcement of this to the world in 1628, what we have called the fourth period of physiological history begins. Harvey's book, "*De Motu Cordis*," is a model record of an ideal scientific investigation. The accumulation of an abundance of the essential facts, obtained by a most careful and systematic study of nature, the clear understanding of their logical positions and their mutual relations, and then, unhampered by scholastic systems and *a priori* considerations, but guided only by a regard for truth, the orderly arrangement of the accumulated material into the one possible rational system—such was Harvey's method. The result was incontrovertible. The full title of Harvey's work is "*Exercitatio Anatomica de Motu Cordis et Sanguinis in Animalibus*," but Harvey himself, being a physician, and his contemporaries and followers naturally enough considered more especially the human bearings of the established facts. For two hundred years after, discovery followed discovery, and the permanent foundations of the various subdivisions of physiology were laid—circulation, respiration, animal heat, the functions of the central nervous system and of the peripheral nerves, movement, animal electricity, reproduction, optics and acoustics. Haller's well-known contribution was that of the independent irritability of muscle. Of perhaps as much value were his complete knowledge of physiological literature and his activity in writing. In 1747 he published a text-book, the "*Primae Lineae Physiologiae*," and in 1757 the large and complete "*Elementa Physiologiae Corporis Humani.*" These books were widely circulated and the entity of the science was forever established. The title of Haller's larger work, "Elements of the Physiology of the Human Body," indicates that its "anthropocentric" character was stamped firmly upon it. By its independent growth, its subordination to medicine was, however, already weakened.

To enumerate its advances during the past fifty-six years, the fifth period, would be a task of great proportions. The

man to whom it is customary to give the credit for having outlined the path that was to be followed during his lifetime and for the generation that has elapsed since his death, the teacher, either personally or by his writings, of the veterans, Ludwig, Du Bois Reymond, Brücke and Helmholtz, was Johannes Müller. Müller's name will at once suggest the one important principle that he formulated, that of specific nerve energies, but his writings and discoveries cover a wide field. His extraordinary knowledge, energy, enthusiasm and stimulating power were all-important during a period so rich with biological achievements. It is perhaps a fair question, whether Magendie, with his marvellous activity as an experimentalist, may not dispute with Müller the honor of having given to the physiology of the past fifty years its characteristic trend. Certain it is that he fathered the science in France (Claude Bernard was his pupil); that his writings were read much across the Rhine; and that the labors of the Germans have been, like his, the collecting of facts rather than the constructing of systems. Within this half-century the establishing of the two great doctrines of physics, the mechanical theory of heat and its greater corollary, the conservation of energy, were of indispensable aid to the development of physiology. The idea of vital force had taken on many forms and the controlling principle of life had played its part under many titles. But, when it was shown that in the inorganic world the various kinds of energy are mutually interchangeable, physiologists, long hampered by and impatient under the old ideas, eagerly siezed upon the new, in fact, aided not a little in their discovery, and proved that they applied to living things as well as to the not-living—and, with this, freedom from unscientific speculation was won; the animal is a machine in a sense more complete than the Cartesian one. On the purely physiological side of biology, this is undoubtedly the greatest achievement of the present century. Until the substance of the plant and the animal body could be regarded as subject to the same laws that controlled all other matter, much must have remained mysterious and inexplicable and physiology could not be reckoned as all in all a

natural science. Psychology has always been hampered by the speculations of the system-loving metaphysicians. More actual fact and less conjecture are essential to the scientific method; and the scientific method is the method of progress. Following this freedom from the doctrine of vital force, physiology has developed actively along two main lines, the chemical and the physical including the mechanical, and is now often defined as the chemistry and the physics of living matter. An astonishing number of discoveries have been made, and the outlines that were sketched by Galen and Harvey and Haller and Müller and Magendie have been filled in with remarkable rapidity and completeness.

Let us consider for a moment the prominent characteristics of the work of this period. In the first place, Vertebrates have received more attention and have been the subject of more systematic investigation than Invertebrates. And among the Vertebrates, with the exception of the indispensable frog, which, however, is rarely regarded as a finality in research, the Mammals, being nearest to man have been most studied. Second, the number of forms used is very small; it is probably safe to say that the genera employed in four-fifths of the researches could be counted easily upon the fingers of the two hands. Third, adult animals have been used almost exclusively. Fourth, the study of organs has prevailed, i. e., the investigator has endeavored to discover the chemical, physical and mechanical laws by which the heart, the lungs, the glands, the muscles and the brain perform their respective tasks. These characteristics are the natural outcome of the birth and growth of the science. They indicate that, although the results accomplished are widespread and of the greatest value, there are left almost untouched still wider fields. The achievement of so much, however, along the lines of the past is stimulating to the student of to-day, for it has made possible the more rapid development of the science in the new directions, in which it is now tending. To these we shall return shortly.

I think that the historian of the present period will not fail to be struck by the comparative paucity of hypothesis in

physiological research, especially when our science is contrasted with the other great division of biology. It is as if men had been nauseated by the vitalistic doctrines and other wild guesses of the past and had resolved hereafter to hold strictly to the Baconian method. At the risk of being misunderstood and criticised, I cannot help feeling that this is to be deplored. The method of all physical science is truly observation and experiment; facts must be discovered and grouped and the laws formulated therefrom. But, in the search after facts, the inestimable value of hypothesis—of speculation, if you will—cannot be denied. It directs the searcher along a definite path and gives for the time being an encouraging and stimulating coherence to his results. If later his speculation becomes verified, well; if it proves false, its use is not to be deprecated, for it has served its purpose as an aid to discovery. The facts still remain, science is by so much the gainer, and with a new interpretation and a new hypothesis nearer the truth further advance will be made. The trouble is to keep the speculation within rational bounds and to know when to give it up. To employ it too sparingly is to retard scientific progress, and it seems to me that just here the animal physiologists of the present period are open to criticism.

Further, it is to be noted that until far into this period throughout the Continental, the English, and most of the American universities physiology and anatomy have together formed one department. At Bonn from 1826 to 1833, and at Berlin from 1833 until his death in 1858, Müller occupied such a common chair. Helmholtz held a similar position in Bonn from 1855 until 1858. Now, everywhere, animal physiology presupposes anatomy, and each science has its own field and its own methods. Further still, physiology usually occupies a place in the Medical faculty. This also is the result of its historical development. As I have shown, it is to the medical fraternity, more than to any other one class, that it owes its great progress in the past. But a glance at the literature of the present period will show that, largely through the efforts of its medical promoters, it has widely overstepped its early

natural science. Psychology has always been hampered by the speculations of the system-loving metaphysicians. More actual fact and less conjecture are essential to the scientific method; and the scientific method is the method of progress. Following this freedom from the doctrine of vital force, physiology has developed actively along two main lines, the chemical and the physical including the mechanical, and is now often defined as the chemistry and the physics of living matter. An astonishing number of discoveries have been made, and the outlines that were sketched by Galen and Harvey and Haller and Müller and Magendie have been filled in with remarkable rapidity and completeness.

Let us consider for a moment the prominent characteristics of the work of this period. In the first place, Vertebrates have received more attention and have been the subject of more systematic investigation than Invertebrates. And among the Vertebrates, with the exception of the indispensable frog, which, however, is rarely regarded as a finality in research, the Mammals, being nearest to man have been most studied. Second, the number of forms used is very small; it is probably safe to say that the genera employed in four-fifths of the researches could be counted easily upon the fingers of the two hands. Third, adult animals have been used almost exclusively. Fourth, the study of organs has prevailed, i. e., the investigator has endeavored to discover the chemical, physical and mechanical laws by which the heart, the lungs, the glands, the muscles and the brain perform their respective tasks. These characteristics are the natural outcome of the birth and growth of the science. They indicate that, although the results accomplished are widespread and of the greatest value, there are left almost untouched still wider fields. The achievement of so much, however, along the lines of the past is stimulating to the student of to-day, for it has made possible the more rapid development of the science in the new directions, in which it is now tending. To these we shall return shortly.

I think that the historian of the present period will not fail to be struck by the comparative paucity of hypothesis in

physiological research, especially when our science is contrasted with the other great division of biology. It is as if men had been nauseated by the vitalistic doctrines and other wild guesses of the past and had resolved hereafter to hold strictly to the Baconian method. At the risk of being misunderstood and criticised, I cannot help feeling that this is to be deplored. The method of all physical science is truly observation and experiment; facts must be discovered and grouped and the laws formulated therefrom. But, in the search after facts, the inestimable value of hypothesis—of speculation, if you will—cannot be denied. It directs the searcher along a definite path and gives for the time being an encouraging and stimulating coherence to his results. If later his speculation becomes verified, well; if it proves false, its use is not to be deprecated, for it has served its purpose as an aid to discovery. The facts still remain, science is by so much the gainer, and with a new interpretation and a new hypothesis nearer the truth further advance will be made. The trouble is to keep the speculation within rational bounds and to know when to give it up. To employ it too sparingly is to retard scientific progress, and it seems to me that just here the animal physiologists of the present period are open to criticism.

Further, it is to be noted that until far into this period throughout the Continental, the English, and most of the American universities physiology and anatomy have together formed one department. At Bonn from 1826 to 1833, and at Berlin from 1833 until his death in 1858, Müller occupied such a common chair. Helmholtz held a similar position in Bonn from 1855 until 1858. Now, everywhere, animal physiology presupposes anatomy, and each science has its own field and its own methods. Further still, physiology usually occupies a place in the Medical faculty. This also is the result of its historical development. As I have shown, it is to the medical fraternity, more than to any other one class, that it owes its great progress in the past. But a glance at the literature of the present period will show that, largely through the efforts of its medical promoters, it has widely overstepped its early

medical boundaries. It has long since ceased to be a purely medical and anthropological science; it has become a biological science. Human physiology, like human anatomy, will necessarily always form one of the foundation stones of a medical training, and perhaps the most important one. But human physiology is but one branch of a science as broad as are the domains of protoplasm. Man's body is a machine, but it is a machine that has had a history. It is an achievement to learn to know the mechanical, chemical, and physical laws of this most complex of vital mechanisms. But the task of the physiologist does not end here—I should say it does not begin here. To know the action of the mechanism without its history is not only short-sighted, it is impossible. This is being recognized and a school of general and comparative physiologists is arising. During the present period, then, beside its great advance along the older lines, our science has begun a development along broader biological paths. It has won a place as an independent, pure natural science. More and more are its claims to admission to Pure Science and Philosophical faculties being recognized. It should be placed and will be placed by the side of chemistry, physics, and the morphological division of biology. I do not think it an exaggerated statement, that the tendency of biological thought at present is toward extraordinary activity along physiological lines.

(*To be continued.*)

THE ORNITHOLOGY OF NEW GUINEA.

By George S. Mead.

(*Mainly from the French of Meyners d'Estrey.*)

The Fauna of New Guinea shines almost exclusively in the variety and beauty of the birds, that are dispersed more or less over the islands surrounding the Papuan continent. Among these islands should be cited those more removed, such as Arrou, Adi and Sabouda, Misole, Salawatti, Batanta, Gagi, the isles of Gebe, King William and Waigeou as well as the principal islands of the great Bay of Geelvink.

It is calculated to-day that more than 400 species of birds belong to this region and it is probable that this number is very far below the correct estimate. The interior of the continent is certainly reserved for great surprises especially when we have become acquainted with the high plateaus of the country.

Of these 400 species, most numerous are those belonging to the families of parroquetts, kingfishers, flycatchers, honey-birds, crows, pigeons and herons. Others more rare, are representatives of the owls, sparrows, hornbills, bee-eaters, woodcocks and ducks.

Among the birds of prey, should be mentioned for its size—*Haliaëtus leucogaster*, which is found all through the Papuan Archipelago, especially the islands of Arrou; but it seems that it does not come to the Bay of Geelvink. The same is true of *Haliaëtus indicus*, while *Pandion haliaëtus* is met with everywhere. *Spizaëtus gurneyi* is the least common of all the birds of prey in the Indies and one does not meet it as a rule at Gilolo and the islands adjacent. Rosenberg obtained a specimen at Salawatti but did not see others.

Astur novæ hollandiæ is equally rare; Rosenberg killed one of these beautiful birds during his sojourn in Mefore. It strays as far as Java where occasionally it nests, and where the natives know it under the name of Tere.

Baza reinwardtii is seen everywhere, especially in gardens in the neighborhood of the huts.

The impenetrable forests under which the country is in some degree buried, serves as a refuge for certain kinds of owls, where it is difficult to take them on account of their solitary habits. Yet they are widely dispersed, and their peculiar cry is frequently heard in the silence of the night even near dwellings and in the center of villages.

New Guinea is par-excellence in Oceania the land of parroquetts. There are known to-day more than thirty species. Many occupy a wide extent of territory; for instance—*Cacatua triton, Microglossus aterrimus, Eclectus polychlorus, Trichoglossus hæmatotus, Lorius scintillatus, Nanodes placens* and *Nasiterna pygmæa.*

Others are confined to narrow limits: for example—*Lorius cyanauchen fuscatus, Nanodes musschenbrœkii, Psittacus brehmii et modestus, Psittacula melanogenia* and *Dasyptilus pecquetii.* The vertical dispersion of these species is very limited.

Microglossus alceto, Eclectus westermanii et *corneliæ,* as also *Lorius semilarvatus,* whose habitat it was supposed was in New Guinea, have never been seen there. It is surprising to find in the little island of Goram, near Ceram, *Cacatua triton,* whereas one might rather expect to see there *Cacatua moluccensis;* it is likely, however, that the former as well as the baboon *Cynocephalus niger* of Batjan, was brought originally to Goram and became wild again there.

Representatives of very many species of cuckoos are here met with; among them *Centropus menebeckii* and *sonneratii* are very common. *Cuculus leucolophus* and *striatus* on the other hand are quite rare.

Among the swifts that are found everywhere, two species especially should be mentioned, viz., *Cypselus mystaceus* and a Collocalia. We may name here also a large species of goatsuckers—*Podargus papuensis,* which inhabits chiefly the islands of Arrou, Waigou and Mefore.

New Guinea is extremely rich in sun-birds, as for example—the *Nectarinia, Ptilotis, Glyciphila* and *Melliphaga.* The large number of birds of this family as well as of the *Malurus* comes

from the blending of the fauna of the Moluccas with that of Australia which are united at it were in New Guinea.

Of the family of thrushes one meets here only three species of which *Pitta novæguineæ* is the most widely extended. The specimens which Rosenberg obtained from the isle of Sowek are different from the others in his account and have been described by Schlegel under the name of *Pitta rosenbergii.*

Flycatchers and analogous species abound in New Guinea and the adjacent islands. They are found without exception on the warm leeward coast.

One finds also frequently in these same islands many species of *Edolius* and *Graucalus* as well as *Eurystomus gularis*, which inhabits the entire Archipelago.

Artamus was not seen by Rosenberg either on the islands of Arrou or Misole, whereas *Cracticus cassicus, Tropidorhynchus novæguineæ* and *Lamprotornis* showed themselves everywhere in great numbers.

Of sixteen species of Kingfishers, *Dacelo gaudichaudii* is the most abundant; *Tanisyptera carolinæ* and *riedelii* are scarce. *Alcedo pusilla* and *solitaria* are quite rare, as well as *Dacelo torotoro.* All these birds frequent the leeward coast to the foot of the mountains.

One species only of hornbill is known in New Guinea—*Bucerus ruficollis.*

The family of Crows is well represented. Among them may be specially noticed *Corvusorru* with its bright-blue eye, and *Chalibaeus ater* of the color of steel.

The Birds of Paradise of which several species are known, are all from New Guinea, and the islands adjacent.

The distribution of some of these species presents some singular facts. One finds amongst others *Paradisea rubra* in Waigeou and Batanta, while at the same time it is not to be found at Salawatti, separated from Batanta only by the strait of Sagevien, which is is not very wide and which these birds could easily cross on the wing.

Paradisea papuana is not met in Salawatti, although this island is nearer the mainland (New Guinea) than Misole where it is said the bird is not lacking.

Paradisea regia is more widely dispersed, and *Paradisea apoda* much less so, for it is confined exclusively to the islands of Arrou. The former is found not only here, but in Misole, Salawatti, Jobi and the mainland.

Paradisea rubra haunts the islands of Waigeou, Gemien and Batanta.

Paradisea magnifica or *speciosa* makes its home in Misole, Salawatti and Jobi.

Paradisea wilsonii is found only in Waigeou and Batanta.

All the above mentioned seek the hot coast lands on the leeward side, while the two following keep at least 2000 feet above sea-level, viz.: *Paradisea sexpennis* and *Paradisea superba;* the latter is confined to the mountains of New Guinea solely.

Paradisea wallacei is found only in Halmahera and Batjan.

In the countries where the Birds of Paradise live, they constitute the bulk of the birds. The work of Wallace gives curious information concerning their habits and mode of life. Rosenberg also writes at length about them in his Notes of a voyage to the islands southeast of the Indian Archipelago. According to his statement the males and females of *Paradisea superba* were the first *undamaged* specimens of this rare species ever seen in Europe.

Epimachi (Plume-birds), species that vie in its plumage with the Birds of Paradise, are found only in New Guinea and Salawatti. Neither Wallace nor Bernstein was able to procure the *Epimachus speciosus* and *gularis* although the latter offered a reward of 80 francs for fine specimens.[1]

Epimachus magnificus and *resplendens* inhabit the mainland. The last is also encountered in Salawatti, in some places even in great numbers.

In Ternate Rosenberg met a traveller, who had brought a small collection of objects of natural history from the North coast of New Guinea, among them one bird in particular that attracted his attention. It was a new species unknown to science, the shape and tints of which resembled those of the female *Epimachus*. An offer was made by Rosenberg for the bird in order that he might secure it for the museum of Leyden,

[1] Confined exclusively to the Mountains of New Guinea.

but was refused. The specimen had been somewhat badly prepared and was not perfect. In compliment to Professor Veth, the savant who did so much to extend our knowledge of ethnology and geography of the Netherland East Indies, Rosenberg named the bird *Epimachus vethii.* Excepting the head, throat and neck the bird was of a brown color (*fuscus*); the upper part of the head was very dark; the back and upper side of the tail were ferruginous, the latter brown in the center. The breast was of a brownish-white, darker below and transversed by arched lines; the beak was curved and black. The length of the bird was about 35 centimetres, of which the tail made 14, the beak 7. The fourth plume was very long. D'Albertis and Meyer when later they visited the district of Arfak and other regions near the Bay of Geelvink, saw this bird which Sclater has named *Drepanornis albertisii.*

We find in Papua only four species of *Paradisiers Loriots*, viz. *Oriolus aureus* and *xanthogaster* that are confined strictly to the continent, *Oriolus flavicinctus* in New Guinea and the islands of Arrou, and *Oriolus striatus* in New Guinea, Waigeou and Salawatti. In museums there are scarcely any perfect specimens of these beautiful birds.

The *Gallinæ* are represented by only four families which, with the exception of the *Otidiphaps*, are found everywhere.

There are great numbers of Pigeons, forty species at least of which are known at present. Some of these are widely dispersed, others are confined to narrow limits.

Three species of Cassowaries live in these parts:—*Casuarius bicarunculatus* which is seen in the islands of Arrou; *Casuarius uniappendiculatus* found in Salawatti and on the northwest coast of New Guinea; and *Casuarius papuanus* inhabiting Arfak and the island of Jobi. These birds seek the flat hot lands but not the marshes.

Rosenberg describes a beautiful live specimen of *Casuarius uniappendiculatus* at Ternate, which was offered to him by the Rajah of Salawatti. This bird was about two years old and had nearly attained full growth although it still wore the brown plumage of its youth. The lovely golden shade of the neck which appears soon after birth, shone in full splendor but

the azure of the head was not so vivid. The bird was very tame, liking men but hating dogs and cats.

The Dromalectores, *Tallegallus* and *Megapodius*, are found everywhere excepting in the mountains.

The Waders frequent the coasts generally, particularly *Tringa* and *Totanus*. There are also many herons, especially in the Archipelago of Arrou, at the straits of Gallewo and in the island of Waigeou.

Aquatic birds are rare, excepting perhaps in Arrou; some species are *Sterna pelecanoides*, *torresi* and *dougalii*, *Podiceps gularis*; lastly the ducks, *Anas arcuata* and *radja*.

NOTES ON A SPECIES OF SIMOCEPHALUS.

F. L. Harvey, Orono, Me.

In a gathering from a spring swamp near Orono, Me., brought into the laboratory by Mr. O. W. Knight, one of my pupils, was found a fresh water crustacean in great abundance. The species is near *S. vetulus* Mueller, but as it differs in several points from the descriptions and figures of that species given by Herrick in his Minnesota Reports, the following observations, accompanied by drawings, are made regarding it.

The striæ in our specimens arise on the ventral margin from *triangular* or *quadrangular* spaces instead of *hexagonal* as stated by Herrick. See Fig. 4. These striæ are often anastomosing and lost in the dorsal region in fine reticulations. The prominence on the posterior part of the shell is variable; obtuse, or obtuse-angled and occasionally obsolete, and also variable in position. It is usually near the dorsal region but in one specimen it is located in the middle. It is always armed with blunt teeth, which extend above and below along the posterior margin of the shell. See Fig. 1. Head often concave in front, though in some specimens rounded as shown in Herrick's figures. Eyes placed near the end of the beak, round, bordered with circular clear cells and bearing on the front, six or seven circular facets darker than the general ground color. What is called the eye seems to be an eye spot bearing dark colored *ocelli*, reminding one of the eye spot of a *Thysanuran*. See Fig. 5.

Inferior antennæ fusiform, bearing in front a prominence armed with a stout spine, which is bulbous at the base and 90μ. long. The body of the antennæ encircled by about six rows of minute blunt teeth, one row of which adorns the distal margin. From the end arise two series of four slender setæ, bearing small bublets at the end. See Fig. 6.

Superior antennæ large. There are three short joints at the base which give great freedom of motion between the

long antennal joint and the body. The antennæ seem to us to be four-jointed below the rami, and this view is strengthened by the fact that in the young the three short basal joints are plainly marked. See Fig. 2. The third basal joint bears on the posterior a prominence armed with two slender spines. These spines show also in the young. See Fig. 2. The fourth, a long stout joint of the antenna, bears on the anterior distal end, a short spine 45μ. long. All the joints of the antennæ are ornamented with encircling rows of minute blunt spines, one row of which is located on the distal end. Rami of the antennæ *three*. The *outer* four-jointed, the basal joint short and unarmed, the second armed with a *short spine* and *not* bearing a *long two-jointed one as shown in Herrick's figures.* The two-jointed setæ arming the other joints of the outer and inner rami are *plumose* the *whole length* and *not naked below as shown by Herrick.*

Third ramus short, located at the base and between the others. Composed of *three* joints, *not two as stated by Herrick.* See Fig. 7.

The basal joint short and broad, the second joint fusiform, the terminal slender and hyaline. See Fig. 7.

The prominence in front of the anus armed with eleven spines, the anterior longest, all curving backward. Body back from the anus abruptly angled and *not gradually sloping* as shown in Herrick's figure. See Fig. 3. There are two long caudal spines at the posterior part of the body not shown by Herrick. See Fig. 3. At the posterior ventral angle of the shell are *four, not three, short stiff* setæ, differing from the slender plumose setæ forward. The setæ arise not from the *margin*, but a considerable distance above the edge of the shell and extend below it. The body of our form is much broader and deeper in relation to the length than shown in Herrick's figures.

In the body above the abdomen in most females were five oblong bodies. While examining one specimen, these bodies began to show motion, and soon were expelled as living young. One of these young is shown in Fig. 2. The eye was two-lobed and the body filled with spherules of a greenish brown color.

In all characters not mentioned, this form agrees with *S. vetulus*, Mueller. Whether the above differences can be explained by omissions and oversights by observers is not known. The sharp angle of the posterior part of the body, the caudal setæ, the reticulations of the shell, the plumose basal joint of the antennæ and the *three joints* of the third ramus of the superior antennæ are enough to characterize a new species near *S. vetulus* Mueller. I have a supply of alcohol and glycerine specimens, or can get living specimens another season, and will be pleased to send them to any one who has authentic specimens of *Simocephalus vetulus*, Mueller, for comparison, as I reluctantly make a new species of this form, never having seen *S. vetulus*, Mueller. We will be pleased to receive specimens of *S. vetulus*, Mueller from any one who has them.

Specimens varied in size from 1.5 mm. to nearly 3mm. Below is given measurements of a good sized specimen.

Measurements. Total length 2.67 mm. Total breadth 1.47 mm. Head from end of beak to where it joins the shell above, .785 mm. Sup. ant. 667 mm.—ratio of joints 10–1–4–$3\frac{1}{2}$–$3\frac{1}{2}$. Inf. ant. 140μ, including spines at the end—long spine in front 90μ.—terminal setæ 33μ. Eyes 107μ. d. Claws at post. end of body .3 mm.

Two setæ at post. part of body .38 mm.

Terminal setæ of ant. .59 mm. Reticulations on side of shell 35μ apart. Plumed setæ on interventral margin 115μ. Third ramus of sup. ant. 115μ, ratio of joints 2 : 5 : 7. Longest spine in front of anus 80μ.

Explanation of Plate.

Fig. 1.—*Simocephalus* species showing the general outlines of the female. (Original.)

Fig. 2.—The young immediately after birth, showing the two-lobed eye and the basal joints of the antennæ. (Original.)

Fig. 3.—The posterior part of the abdomen showing the angle back of the anus and the posterior setæ. (Original.)

Fig. 4.—The triangular reticulations on the the ventral posterior margin of the shell. The petagonal and quadrangular cells, that sometimes occur above the marginal triangular cells are shown. (Original.)

Fig. 5.—The circular eye spot with marginal clear cells and the dark colored ocelli upon the face. (Original.)

Fig. 6.—The inferior antenna showing the spine in front, the two series of bulbous setæ at the end and the encircling rows of teeth. (Original.)

Fig. 7.—Short three-jointed ramus at the base and between the two large rami of the superior antenna, (Original.)

EDITORIALS.

—THOSE who hold place in our municipal government are necessarily "men of affairs," and are very rarely possessed of the love of nature. Their idea of a tree is primarily based on its market value, but if it be necessarily ornamental by reason of its position, their idea of beauty consists in truncated branches with a coronæ of sprouts surrounding their extremities. Forest is in their view only attractive when it is cleared of smaller growth, and grass sown in its stead; and thickets of shrubs and vines are necessarily to be burned. Hills must be leveled, ravines must be filled up, and nature's slopes must be replaced by dressed stone walls. At all this the lover of nature rebels for various reasons. Such interference with natural processes produces utter poverty, and wood and field are robbed of one of their charms, variety. In a park which receives such treatment, where ten species of trees grew, but one remains. From the hillsides the native shrubs have disappeared, and on the open, which was once a bed of flowers, there remains but the monotonous grass, reduced if possible to a single species. Such treatment destroys the haunts of bird and insect, and lays open the few venturesome wild things that remain, to the persecutions of the rabble, who would never otherwise know of their presence. It is important that this official vandalism should never enter our public parks, or that it should be speedily suppressed whenever it shows itself. Our parks are for the instruction of the public as well as for their relaxation. Stone walls and graded paths abound in the city, and mutilated trees line the streets. Let the parks be pictures of the great nature with its energies untrammeled and its processes in view of every citizen who wanders in their shades or repose on their banks. Let its forest teach the lesson of decay as well as of birth and life, and *abeste profanes*, hands off, of wonders that man cannot imitate or improve upon.

—VOGUE is a form of automatism, and it is natural to man, since it is always easier to imitate than to create. There are vogues in naming, vogues in studying, and some other kinds of vogues to which naturalists are liable, as vogues affect other men of other professions. We are moved to these reflections by the observation of the vogue which has been enjoyed for three quarters of a century by the alleged adjective *madagascariensis*. From *Daubentonia madagascariensis* to *Megaladapis madagascariensis*, a long processon of *madagascarienses*

has filed into place in our nomenclature, there to remain until time and language shall be no longer. To account for this phenomenon we we cannot point viridically to the euphony of the word, nor to the great economy of time and space which we secure by adopting it. That suggestion and automatism have much to do with this custom there can be no doubt, but we venture a hypothesis which may relieve us of the painful suspicion that this ready yielding to ones subliminal self may be due to poverty of classical knowledge or inventive capacity, or both. The originator of the term foresaw the possibilities of the Malagassy language for cacaphony, so to avoid such terms as antananarivoënsis, and amboulisatrensis, he set the fashion at madagascariensis, and so it has remained. It is true that there are a few species of animals inhabiting the great island which are not named madagascariensis, but they must always remain in comparitive obscurity. But it might be well to place the name on the retired list in view of its eminent services in the past, especially as there some new aspirants to public favor which will give it a competition too serious for its years. The cacophony mill which produces Propalæhoplophorus and Brachydiastematotherium is still in motion, and we look for new revelations which will utterly destroy the usefulness of madagascariensis by placing it among the words of one syllable in the nomenclatorial primer.

—There is at present no law for the punishment of poachers in our National Parks. As a consequence the officers in charge can only escort men who are detected in this invasion of the rights of the public to the boundary, and there discharge them. As a consequence poaching has become rather a pleasant pasttime than otherwise. The recent detection of some men who have for several years been killing bison in the Yellowstone National Park, will perhaps stimulate Congress to remedy the evil. A bill is at present in the hands of the Committee on Territories of the House of Representatives which will if passed furnish the necessary legislation. We hope that nothing will prevent its early passage by both houses.

—We learn that the Sundry Civil Bill as sent to the House by the Committee on appropriations has not reduced the appropriations for the scientific work of Government bureaus below the amounts paid last year. We should be thankful for this in view of the extremely economic tendencies of the present congress.

—The legislature of Missouri is hesitating to make an appropriation for the continuance of the zoological survey. It will make a serious economic mistake if it fails to grant the usual sum.

PLATE IX.

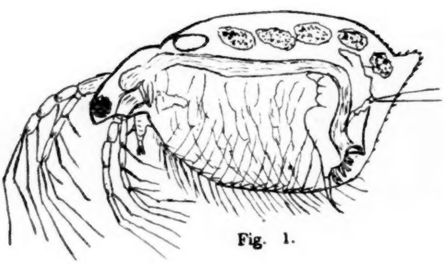


Fig. 1.

Fig. 5.

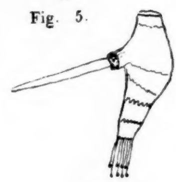


Fig. 6.

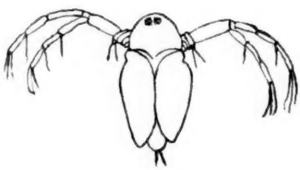


Fig. 2.

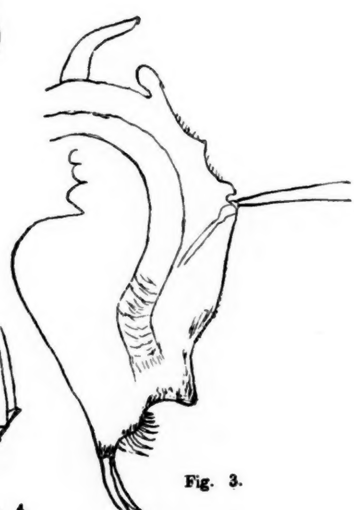


Fig. 3.

Fig. 7

Fig. 4.

F. L. Harvey, Del.

Simocephalus vetulus, **Müller.**

RECENT BOOKS AND PAMPHLETS.

Annual Report of the Bureau of Ethnology for 1886—87. Washington, 1891. From the Smithsonian Institution.

Annual Report Geological Survey of Canada, 1890-91. Vol. V. Parts I and II. From the Survey.

BOLLMAN, C. H.—The Myriapoda of North America. Bull. No. 46, U. S. Natl. Mus. Washington, 1893. From the Smithsonian Institution.

Bulletin No. 21, 1893, Iowa Agri. Exper. Station.

Bulletin No. 92, North Carolina Agricultural Experiment Station, August, 1893.

CHAPMAN, F. M.—Description of Two New Races of Mammals from Florida, with Remarks on *Sitomys niveiventris* Chapman. Extr. Bull. Am. Mus. Nat. Hist., Vol. V, 1893. From the author.

CUMMINS, W. F.—Notes on the Geology of Northwest Texas. Extr. Fourth Ann. Rept., 1892. From the author.

DALL, W. H.—Land Shells of the genus Bulimulus in Lower California, with descriptions of several new species. Extr. Proceeds. U. S. Natl. Mus., Vol. XVI, 1893. From the Smithsonian Institution.

DAWSON, SIR J. WM.—The Canadian Ice Age. Montreal, 1893. From the author.

DAWSON, G. M.—Geological Notes on some of the Coasts and Islands of Behring Sea and Vicinity. Extr. Bull. Geol. Soc. Am., Vol. V, 1894. From the Society.

DAY, D. T.—Mineral Resources of the United States for 1892. Washington, 1893. From the Smithsonian Institution.

DEPERET, M.—Sur l'age absolu des faunes des Mammiféres pliocénes du Plateau central et des éruptions volcaniques contemporaines. Extr. du Compte-rendu des séances de la Soc. Geol. de France, Sept. 16, 1893. From the author.

DUMERIL, A. ET BOCOURT.—Études sur les Reptiles et les Batraciens; Troisième Partie d. Recherches Zoologiques; Mission Scientifiques au Mexique et dans l'Amerique centrale. Paris, 1893. From the authors.

Eleventh Report of the California State Mineralogist (First Biennial). Two years ending September 15, 1892.

Fifth Annual Report of the Board of Managers of the Rhode Island College of Agri. and Mechan. Arts. Part II, 1893.

GOEBEL, K.—Gedächtnissrede auf Karl von Nägeli gehalten in der öffenlichen Sitzung der k. b. Akademie der Wissenschaften zu München am 21 März, 1893. München 1893. Im Verlag der k. b. Akademie. From the author.

HARLAN, MR. JUSTICE.—Opinions at the Conference in Paris of the Behring Sea Tribunal of Arbitration, constituted by the Treaty of Feb. 29, 1892, between Her Britannic Majesty and the United States of America. Washington, 1893.

HOBBS, WM. H.—On the Geological Structure of the Mt. Washington Mass of the Taconic Range. (Extr. Journ. Geol., Vol. I, 1893). From the author.

HOLLICK, A.—Observations on the Geology of Martha's Vineyard. Extr. Trans. N. Y. Acad. Sci., XIII, 1894. From the author.

Ihering, H. von.—Os Mammiferos do Rio Grande do Sul. 1893. From the author.

Johnson's Universal Cyclopædia, Vol. II. New York, 1893. From the Publishers.

Jordan, D. S. and Fesler, Bert.—A review of the Sparoid Fishes of North America and Europe. Extr. Report U. S. Fish Commissioner of Fish and Fisheries 1889–91. From the authors.

Lawson, A. C. and Posada, Juan de la C.—The Geology of Carmela Bay. Extr. Bull. Univ. of California, Vol. I, 1893. From the author.

Lebouaq, H.—Anatomie des formes extérieures du talon. Extr. Ann. Soc. Méd. de Gaud, 1893. From the author.

Leche, W.—Studien über Entwicklung des Zahnsystems bei den Saugethieren. Separat-Abdruck aus Morpholog. Jahrb. XIX, Leipzig, 1892. From the author.

Lydekker, R.—On two Dinosaurian Teeth from Aylesbury. Extr. Quart. Journ Geol. Soc., Nov., 1893. From the author.

Memoirs of the National Academy of Sciences, Vol. VI. Washington, 1893.

Miller, G. S.—Description of a New Mouse from Southern New Mexico and Arizona. Extr. Bull. Am. Mus. Nat. Hist., Vol. V, 1893. From the author.

Mitchell, C. P.—The enlargement of the Sphere of Women. London, 1892. From the author.

Osborn, H. F.—The History and Homologies of the Molar Cusps. Extr. Anat. Anz., 1892. From the author.

Palache, C.—The Soda-Rhyolite North of Berkeley. Extr. Bull. Univ. of California, Vol. I, 1893. From the author.

Piersol, G. A.—Normal Histology, including an account of the development of the Tissues and of the Organs. Philadelphia, Pa., 1893. From the author.

Pilling, J. C.—Bibliography of the Salishan Languages. Issued by the Bureau of Ethnology. Washington, 1893. From the Smithsonian Institution.

Prestwich, J.—On the Evidences of a Submergence of western Europe and the Mediterranean Coasts, at the close of the Glacial or so-called Post-glacial period, and immediately preceding the Neolithic or Recent Period. Extr. Phil. Trans. Roy. Soc. London, Vol. 184, 1893. From the author.

Rathbun, M. J.—Descriptions of new species of American Fresh Water Crabs. Extr. Proceeds. Natl. Mus., Vol. XVI, 1893. From the Smithsonian Institution.

Report of the Commissioner of Education for 1889-90, Vol. 2. Washington, 1893 From the Smithsonian Institution.

Report of the United States Commission of Fish and Fisheries for 1889–91. Washington, 1893. From the Smithsonian Institution.

Report for the year 1892–93, presented by the Board of Managers of the Observatory of Yale University to the President and Fellows.

Ridgway, R.—Description of a new Storm Petrel from the coast of western Mexico.

——A Revision of the genus Formicarius Boddaërt. Extr. Proceeds. U. S. Natl. Mus., Vol. XVI, 1893. From the Smithsonian Institution.

Ritter, W. E.—Tunicata of the Pacific Coast of North America. I *Perophora annectens* n. sp. Extr. Proceeds. Cal. Acad. Sci., Vol. IV, Ser. 2, 1893. From the author.

STERKI, DR. V.—Observations on Vallonia. Extr. Proceeds. Phila. Acad., 1893. From the author.

STEVENSON, J. J.—On the Origin of the Pennsylvania Anthracite. (Extr. Journ. Geol., Vol. I, 1893.)——On the Use of the Name "Catskill." (Extr. Am. Journ. Sci., Vol. XLVI, 1893.) From the author.

TARR, R. S.—Glacial Erosion. Extr. Am. Geol., Vol. XII, 1893. From the author.

TULLBERG, T.—Ueber einige Muriden aus Kamerun. Mitgetheilt der Königl. Gesellschaft der Wissensshaften zu Upsala, 27 Juni, 1893. From the author.

WEED, C. M.—A descriptive catalogue of the Harvest Spiders of Ohio. Extr. Proceeds. U. S. Natl. Mus., Vol. XVI, 1893. From the Smithsonian Institution.

WHIPPLE, L. E.—The Philosophy of Mental Healing. New York, 1893. From the Metaphys. Pub. Co.

WHITEAVES, J. F.—Presidential Address.——The Cretaceous System of Canada. Extr. Trans. Roy. Soc., Canada, 1893. From the author.

Wilder Quarter-Century Book. A collection of original papers dedicated to Professor Burt Green Wilder at the close of his twenty-fifth year of service in Cornell University (1868–1893). By some of his former students. Ithaca, N. Y., 1893. From Mr. Burt Wilder.

RECENT LITERATURE.

On the Classification of the Myxosporidia, a group of protozoan parasites infesting fishes. (Art. 10, Bull. U. S. Fish Commission for 1891, pp. 407–420. Washington, D. C., 1893). By R. R. Gurley.

This paper is a communication preliminary to a more extensive report at present in manuscript. Several new terms are introduced, a new classification is proposed, three new species described and twenty species mentioned by other authors, but not named, are given binomial names. All of these species will be figured in the final report.

The new terms are as follows: *pansporoblast,* the plasma-sphere from which the sporoblasts arise; *sporoplasm,* the protoplasm of the spore; *capsular index,* the ratio of the length of the capsule to the antero-posterior diameter of the shell-cavity; *pericornual nuclei,* the two nuclei (" granules," " globules ") at the antero-lateral angles of the sporoplasm or on the posterior extremities of the capsule.

Gurley's classification is based upon the symmetry of the spores as the most important taxonomic criterion and differs from Thélohan's classification in several particulars. Two orders with five families are recognized. One new genus (*Pleistophora*) is proposed; *Sphærospora* Th. and *Myxosoma* Th. are fused into a subgenus *Sphærospora* of the genus *Chloromyxum* Ming. The following key, based upon Gurley's tables and descriptions will show the plan of his classification.

Subclass *Myxosporidia ;* pansporoblast produces—

I. Many (at least 8) minute spores, lacking distinct symmetry and possessing but one capsule — Ord. *Cryptocystes.*

A. Spores numerous, inconstant; pansporoblast membrane $\frac{1}{m}$

a. Not subpersistent; myxosporidium present — Gen. *Glugea Th.*

b. Subpersistent; myxosporidium absent — Gen. nov. *Pleistophora.*

B. Spores constant (8); pansporoblast membrane subpersistent; myxsoporidium absent — Gen. *Thelohania* Hen.

II. Few (2 at most) rather large spores with distinct symmetry and two or more capsules — Ord. *Phænocystes.*

Spores symmetrical bilaterally; antero-posterior symmetry $\frac{1}{m}$

A. Present — Gen. *Cystodiscus* Lutz.

B. Absent; capsules in—
a. Two groups, right and left wings; not bivalve — Gen. *Myxidium* Büt.
b. One group, at anterior end; bivalve; capsules—
α. Four — Gen. *Chloromyxum* Min.
β. Two; inclination of plane of junction of valves to longitudinal plane
*0°; vacuole present — Gen. *Myxobolus* Büt
**90°; vacuole absent; sporoplasm unilateral — Gen. *Ceratomyxa* Th.

The family *Glugeidæ* includes the genera *Glugea, Pleistophora* and *Thelohania; Chloromyxidæ* includes *Chloromyxum* and *Ceratomyxum,* while the families *Myxidiidæ, Myxobolidæ* and *Cystodiscidæ,* each include but one genus.

As new species are described:—

1. *Myxobolus globosus* from branchial lamellæ of *Erimyzon sucetta;* globose, 7–8μ long by 6μ broad by 5μ thick; capsular index somewhat more than 0.50.

2. *M. transovalis* under scales of *Phoxinus funduloides;* 6–7μ long by 8μ broad; cap. ind. 0.50.

3. *M. macrurus* subcutaneous tissue of *Hybognathus nuchalis*; 10–11μ by 6–8μ by 4μ; tail 30–40μ; for further description see original.

The following species have been given binomial names:—

1. *Cystodiscus ? diploxys* from *Tortrix viridana,* vid. Balbiani, 1867.
2. *Myxobolus unicapsulatus* from *Labeo niloticus,* vid. Müller, 1841.
3. *M. inequalis* from *Pimelodus clarias,* vid. Müller, 1841.
4. *M. oblongus* from *Erimyzon sucetta,* vid. Müller, 1841.
5. *M. bicostatus* from branchiæ of *Tinca tinca,* vid. Bütschli, 1882.
6. *M. lintonii* from *Cyprinodon variegatus,* vid. Linton, 1891.
7. *M. obesus* from *Alburnus alburnus,* vid. Balbiani, 1883.
8. *M. cycloides* from *Leuciscus rutilus,* vid. Müller, 1841.
9. *M. spheralis* from *Coregonus fera,* vid. Claparède, 1874.
10. *M. perlatus* from *Gymnocephalus cernua,* vid. Balbiani, 1883.
11. *M. ? zschokkei* from *Coregonus fera,* vid. Zschokke, 1884.
12. *M. monurus* from *Aphododerus sayanus,* vid. Ryder, 1880.
13. *M. strongylurus* from *Synodontis schal,* vid. Müller, 1841.

14. *M. kolesnikovi* from *Coregonus fera*, vid. Kolesnikoff, 1866.
15. *M. linearis* from *Pseudoplatystoma fasciatum*, vid. Müller, 1841.
16. *M. schizurus* from *Esox lucius*, vid. Müller, 1841.
17. *M. creplinii* from *Gymnocephalus cernua*, vid. Creplin, 1842.
18. *M. diplurus* from *Lota lota*, vid. Bütschli, 1882.
19. *Chloromyxum mucronatum* from *Lota lota*, vid. Müller, 1854.
20. *C. incisum* from *Raja batis*, vid. Müller, 1851.

C. W. STILES.

Stiles' and Hassall's Cestodes.—The publication by Dr. Stiles of several preliminaries, notably one in the *Centralblatt für Bacteriologie und Parasitenkunde*, 1893, No. 14–15, has led helminthologists to look with interest for the appearance of his revision of the Cestodes which has just been issued.[1] The letter of transmittal by the Chief of the Bureau calls attention to the importance of accurate knowledge as to specific limits, since "every separate species has a separate source of infection," and remarks truly that this paper "covers the results of a more thorough and extensive study of the tapeworms of cattle and sheep than has ever before been attempted."

Both authors are responsible for the bibliography and for the work on new species, Dr. Stiles, however, alone for the studies on species already known. The work is based on a careful and exhaustive study of internal anatomy, not only of our own forms but also of the foreign species. In almost every instance the original types have been consulted with the result that now for the first time the character and limits of some of Rudolphi's species are known. In this connection the importance of preserving the type specimens cannot be too strongly emphasized. Dr. Stiles' experiments have shown that different methods of preservation result in such differences in external appearance and proportions, that no dependence can be placed on these data for specific determinations, the only safe generic and specific determinations are those based on internal anatomy. Careful study along this line has yielded unlooked for results. The topographical anatomy of the excretory system was shown in the preliminary already cited to be of great value in separating the genera in the family of the Tæniidæ and it forms the basis of the division employed in the present paper.

In the adult tape-worms of sheep and cattle, Dr. Stiles recognizes four genera:

[1]A Revision of the adult Cestodes of Cattle, Sheep, and allied animals. By C. W. Stiles, Ph. D., and Albert Hassall, M. R. C. V. S. U. S. Dept. of Agr., Bureau of Animal Industry, Bulletin No. 4, Washington, 1893; 103 pp., 16 plates.

I. Moniezia (Blanchard) which falls naturally into three groups:
   a. The Planissima group, with linear interproglottidal glands.
   b. The Expansa group with interproglottidal glands grouped around blind sacs.
   c. The Denticulata group, without interproglottidal glands.
2. Thysanosoma (Diesing), single uterus with ascon-shaped egg-sacs. Genital canals pass between longitudinal canals.
3. Stilesia (Railliet), for *Taenia globipunctata* and, provisionally, *T. centripunctata.*
4. Species inquirendæ.

In the special part of the genus Moniezia is considered first and most fully. Its three subgenera depend upon the presence and arrangement of the interproglottidal glands first described by Dr. Stiles. These are absent in one subgenus; in the second they form a deeply colored line in the stained specimen near the posterior edge of the proglottids, and finally in the third subgenus they are localized around blind sacs which open between the proglottids. For particulars of each species the original paper should be consulted; it gives under each a full synonomy with a valuable list of hosts and of the geographical distribution so far as known, a bibliography of the species, a historical review and a detailed account of the anatomy. This is followed by a specific diagnosis based on the anatomical description and a statement with regard to the collections in which type specimens may be found.

Among interesting details in the genus Moniezia may be mentioned that on the right side the vulva is ventral, the cirrus dorsal, while on the left the reverse position obtains. New are the species *M. planissima, M. trigonophora* and *M. oblongiceps.* The systematic position of *M. benedeni* and *M. Neumanni* does not seem to have been satisfactorily ascertained since the material at hand failed to yield good preparations; Dr. Stiles refers them, however, to the Planissima group.

By examining some of the original specimens from Rudolphi's collection, the exact limits of *M. expansa* (*Tœnia exp. Rud.*) were determined. It is evident that most helminthologists have included more than one species in their descriptions. The old genus Thysanosoma (Dies.) is reestablished to include the form subsequently named by Diesing *Tœnia fimbriata*, and *T. giardii* Riv. Of especial interest may be mentioned the presence of two transverse canals in *Th. actinoides.* The necessity of a new genus for *T. globipunctata* and *T. centripunctata* was pointed out by Stiles in his preliminary; meantime

Railliet had reached the same conclusion independently and formed for them the genus Stilesia. Its anatomy is discussed here.

Part IV, the discussion of species inquirendæ, is followed by a short half page on the life history, and two pages of general conclusions. Here is included a key for the determination of species. It is undoubtedly more difficult to use than those of Moniez or Neumann, and on that account will no doubt be criticized and perhaps disregarded by some; it is, however, more accurate and allows a determination of the species as well as the genus, which heretofore has not been possible. Part VII is a valuable compendium of species according to hosts with commendable cross references. In the addenda the fact of the gradual failure of the interproglottidal glands to stain as the material macerates, and the consequent possible identity of some species are discussed.

The bibliography given is very full and under each title is a word or two of valuable explanation. Yet it is on the whole the least satisfactory part of the paper. One could wish that the authors had used a better system of reference than by numbers; these differ of course in the bibliography of each species and in the general list, and the confusion could not but lead to mistakes. Had the year system been used, references would have been alike for all lists, and such an error as is noted on p. 32, where "my note (26)" refers actually to a book by Dewitz, would not have been possible. Apart from the system, however, some omissions are noted. Thus on p. 26, and again on p. 42, in the synonomy, Blainville is quoted "after Baird, 1853," but neither name can be found in the general or in the special bibliographical list. The same can be said of Mégnin p. 87. The habit of scattering references at the bottom of the page (p. 66), or through the text (p. 72), also seems open to criticism.

These are, however, but slight defects in a work which is on the whole so worthy of high praise. As the first scientific study of taxonomical helminthology which has been made in this country, is is fitting that it should have eminated from the zoologist of the Bureau ot Animal Industry. It is, to be sure, purely scientific work; but its practical and economic value are correctly insisted upon by the Chief of the Bureau in his letter of transmittal already quoted. The Bureau is to be congratulated also upon the general appearance of the bulletin and especially upon the sixteen fine plates which are the work of its artist, Mr. Haines.

The Bureau does great service in offering to museums and private collections well preserved specimens of these tape-worms in exchange.

Of equal value is the exhaustive card catalogue of parasites and hosts kept by the Bureau. It is freely at the disposal of scientific workers, and by means of it one can refer to a desired species or to the entire literature on any parasite. Such an undertaking would be impossible save in the great libraries of the world, among which those at Washington are rated. Any one who, like the reviewer, has had occasion to refer to this catalogue, will appreciate its value and will join in wishing that such work may be long continued under the patronage of our Department of Agriculture.

HENRY B. WARD.

Clark's Microscopical Methods.[2]—This volume is hardly up to the times, being apparently the production of a man ignorant of modern methods of microscopical research. Thus we note an utter absence of any reference to such fundamental matters as serial sections, staining on the slide, the use of any fixing and hardening reagents except alcohol. We meet continually sentences like this "It is to be understood that the somewhat complicated processes of imbedding in paraffin and colloidin are not recommended for general use." We can say the same of the book.

Dodge's Practical Biology.[3]—To the long list of laboratory guides, the new year adds another. Professor Dodge has had considerable experience in teaching both high school (Detroit) and college (Rochester Univ.) classes and this work is the outcome of his experience. It is, as its name indicates, a guide to biology. It takes up first, the biology of the cell, treating of unicellular organisms and cells from the tissues of higher forms and then later, not in the sandwich manner but in the sequence which most teachers would adopt, takes up first the animals and second the plants. The directions for laboratory work are well and carefully drawn, and, a point which we note with pleasure, the student is told what to look for, not what he will find. He cannot answer the questions without recourse to the specimens, while the absence of illustrations renders it impossible for him to copy the diagrams in the book. Not only is structure studied, but, to such extent as is possible with the average student and with average facilities, the physiology as well.

[2]Practical Methods in Microscopy, by Charles H. Clark. Boston, D. C. Heath & Co., 1894, 120 pp., XIV+219.

[3]Introduction to Elementary Practical Biology. A laboratory guide for high school and college students, by Charles Wright Dodge. New York, 1894. 120 pp., xxiii, 422.

Aside from some minor slips of no importance, our greatest criticism would be that the work goes too much into detail, calling the students attention as strongly to minute points without any morphological importance as to those facts more pregnant with meaning. This, of course, is a minor matter where the student has a good course of lectures to accompany the laboratory work. It would be even less objectionable were there good text-books to assist him, but, as yet, the zoological text-book is a matter for the future.

Excepting this matter of lack of perspective which the student will in most cases be troubled with, we like the work and we feel confident of its adoption in many schools.

General Notes.

GEOLOGY AND PALEONTOLOGY.

The Geology of the Antartic Continent.—So little is known of the Antarctic polar regions that the résumé of facts given by Dr. John Murray, in a recent address before the Royal Geographical Society is of especial interest. Dr. Murray believes that there is abundant evidence of true continental land within the Antarctic circle, equal if not surpassing in extent the continent of Australia. Ross reports gray granite in the neighborhood of Victoria Land, and Dr. Donald secured some Tertiary fossils from the Seymour Island. D'Urville found both granite and gneiss exposed on an island near Adélie Land, while Wilkes describes an iceberg in the same locality covered with clay, mud, gravel, stones and large boulders of red sandstone and basalt, 5 or 6 feet in diameter. During the Challenger expedition fragments of granite and quartz were dredged from the bottom of the sea at the fortieth parallel of south latitude and as the vessel proceeded toward the Antarctic circle these fragments of rocks increased in number until they together with mineral particles and mud derived from land made up the larger part of the deposit. These fragment consist of granites, quartziferous diorites, schistoid diorites, amphibolites, mica schists, grained quartzites, sandstones, a few fragments of compact limestone, and partially decomposed earthy shales. They are distinctly indicative of continental land, and were undoubtedly transported by icebergs from the South Polar regions.

Among the numerous maps used by Dr. Murray to illustrate his paper is one showing the oceanic deposits around the Antarctic continent. Near the Antarctic land are the terrigenous deposits made of detritus from the continent. Glauconite is found in the blue mud of this area. A little to the north, the bottom is covered with a pure white siliceous deposit, the Diatom Ooze. Still further to the north, where the Diatoms on the surface have been replaced by Foraminifera and Pteropods, the deposit is a pinkish-white Globigerina Ooze. In latitude about 40° S. the sea is about 3 miles in depth, and here the deposit is composed of a fine Red Clay, manganese nodules, zeolitic crystals, spherules of extra-terrestrial origin, thousands of sharks teeth, and the remains of Cetaceans. In this red clay area a trawl brought up in a single hand over 1500 sharks teeth, some of them not to be distinguished from the

specimens of Carcharodon, found in the Red Crag of England. (Geog. Journ., Jan., 1894.)

Intrusive Sandstone Dikes in Granite.—During the summer of 1893, a peculiar sandstone rock composed of worn quartz grains was discovered in the neighborhood of Pikes Peak in the western side of the narrow Manitou park basin of sedimentary rocks. This rock occurs as the filling of an extensive system of fissures in granite under circumstances indicating that the sand was forced into the fissures under great pressure. Mr. Whitman Cross discusses the origin of these Dikes without, however, coming to any definite conclusion. So far as he is aware no other occurrence of sandstone dikes in granite has ever been described. They may be compared with the remarkable occurrences in California described by Diller.[1] These latter, however, were in shales of a great sedimentary complex of Cretaceous age, and they were parallel to a system of jointing planes in the strata. Moreover, Diller noted that below the horizons occupied by the dikes there occurred sandstone strata of a composition identical with that of the dike-rocks. The very plausible theory presented by Diller was that the fissures represented by the dikes were formed by earthquake shock, and that the sand was injected as quick-sand into the fissures under hydrostatic pressure from unconsolidated water-bearing sand layers below.

The Colorado dikes are more difficult to explain than those of California in that the known facts do not indicate the source of the sand; yet the physical and mechanical facts do seem to show that the fissures of this dike complex were filled by a fine quick-sand injected from a source containing a large amount of homogeneous material. On the one hand, it is impossible to suppose that such a system of fissures, large and small, with their many intersections, could remain open to be filled by any slow process, and, on the other hand, it is equally impospossible to believe that the uniformity and purity of the material filling the fissures, varying from mere films on cleavage planes of orthoclase grains in the granite to dikes several hundred yards in width, could have resulted from infiltration.

It has been stated above that the belt of observed dikes lies adjacent and parallel to the Manitou park basin of sedimentary rocks, the principal element in which is the red sandstones and grits of the Carboniferus (?) or Trias (?). These beds are, however, of much coarser and more heterogeneous character than the dike-rock, and the observations made do not suggest that the proximity is anything more than accident-

[1] Sandstone Dikes, J. S. Diller: Bull. Geol. Soc. Am., Vol. I, 1889.

al. It is not known that the dikes are younger than the sedimentary, for they were nowhere found in contact. The strata of the basin are now seen at the same level with the dikes, but faulting and a synclinal fold have clearly lowered them with reference to the granite on either side. Finally, it is probable that the dikes are not limited to the vicinity of the sedimentary basin. Neither end of the belt containing the dikes was determined, and an observation by Professor G. H. Stone shows plainly that sandstone dikes do occur in the same general strike line far removed from any sedimentary rocks. (Bull. Geol. Soc. Am. Vol. 5, 1894.)

The Origin of the Vichy Mineral Waters.—M. Dollfus has been making a study of the geology of the environs of Vichy and comes to the following conclusions as to the origin of the celebrated medicinal water of that region.

The waters charged with soda derived from the decomposition of porphyry percolate the earth in contact with carboniferous conglomerates and the Culm strata flowing in a synclinal. When their downward course is checked by the granules or the micropegmatites which are impermeable, they reascend through the tertiary beds. Here their flow is partially impeded by the arkose beds which are topped by the Cusset Marls, and an immense water sheet is formed near the contact of these two formations. Atmospheric waters are here the important factors, and the carbonic acid gas with which they are charged becomes an active agent, displacing even the silicic acid of some of the feldspathic compounds. In short the alteration is set up at the surface; decomposition and kaolinization of the porphyrites goes on, under our eyes, at the surface, for, below we see compact, unaltered rocks, in which no chemical activity is apparent.

The origin of the carbonic acid is more difficult to explain. Since the atmospheric waters do not furnish a large enough supply, some of it, as well as the lime, must be derived from chalks of Vernet and the water-bearing marls of Cusset. The phorphyritic strata are limited around the Central Plateau; the presence of granite, covering of impervious clay, an abundance of lime, and all the peculiar series of conditions which are met with at Vichy and no where else, explain the formation of these peculiar mineral waters and their isolation in the midst of hydraulic basins of which the products are so very different. (Rev. Sci. Mars, 1894.)

Metamerism in the Skull of Primordial Palæozoic Fishes.—One of the most interesting of recent discoveries is that by Dr. J. V. Rohon[1] regarding the fossils fishes of the genera *Thyestes* and *Tremataspis* from the upper Silurian strata of the island of Oesel. Both genera belong to the order Aspidocephali. In *Thyestes* the cartilaginous primordial cranium falls into two distinct regions, anterior and posterior, the former of which is bilaterally segmented, the latter not. On each side of the anterior region five segments are recognizable, the proximal being joined to the middle skull mass, the distal portions being discrete, more or less pointed and arched behind. In the region of the second and third segments is the median frontal organ, between the third and fourth is the well marked optic capsule, while the parietal organ is above the fifth segment and between it and the hinder region of the skull. The hinder portion, representing the occipital region, is in form much like the body portion of the skeleton. Ventrally to it are apparently the remains of gill arches. Labyrinth and jaw apparatus are not differentiated.

From these facts Rohon concludes that the Aspidocephali cannot belong to Cyclostomes, Selachians, Ganoids or Leptocardii. They must belong to a distinct subclass for which he proposes the name Protocephali. The paper is a preliminary one and the complete article with plates will be awaited with interest.—K.

Mr. Rohon does not explain what he understands by the term Aspidocephali. The genera Thyestes and Tremataspis have been hitherto included in the family Cephalaspidæ of the order Osteostraca of the subclass Ostracophori of the class Agnatha. M. Rohon's observations show that this systematic arrangement needs no modification, except that the genera Thyestes and Tremataspis must be separated as a family distinct from the Cephalaspidæ.—C.

The Auriferous Slates of the Sierra Nevada.—In a recently published paper, Mr. J. P. Smith reviews the opinions of previous writers as to the age of the auriferous slates of the Sierra Nevada, and after giving a brief statement of recent discoveries and determinations of fossils from the beds in question, embodies the results of his investigations in the following conclusions:

"The Auriferous slates are known to consist of Silurian, Carboniferous, Triassic and Jurassic strata."

"The Mariposa slates are of Upper Jurassic, probably lower Kimmeridge age."

[1] Zool Anzsiger XVII, p. 51, 1894.

"The uplift and metamorphism of the Sierra Nevada and of the Coast range occurred in late Jurassic time, before the deposition of the Cretaceous."

"Neumayer's theory of climatic zones cannot be applied with exactness to the Jura of California, which can be understood only by the study of the geographic provinces of that time." (Bull. Geol. Soc. Am. Vol. 5, 1894.)

Comparison of Jurassic and Upper Cretaceous Trituberculates.—In a paper on upper Cretaceous Mammals, Prof. Osborn makes the following comparison of the Laramie mammalian dentition with that of the earlier Purbeck, and of the later Puerco.

"In the Laramie the modern placental or marsupial dental formulæ are established—the teeth behind the canine are usually seven, and do not usually exceed eight. Marsh observes in one jaw what he considers five premolar alveoli. Second, out of the high crowned upper molars of the Jurassic, such as those of *Amblotherium* and *Spalacotherium,* a relatively low-crowned or bunodont trituberculur molar has been evolved; as this is a possible parent form of the ungulate and primate upper molars, it is an essentially Tertiary type. Third, the lower molars have evolved a broad talonid or heel, which in many cases presents three cusps, whereas in Jurassic types the talonid is a spur or a narrow simple basin. Fourth, the trigonid, which is always very elevated in the Jurassic types, sinks in some cases to the level of the Talonid—another modernization looking toward ungulate and primate ancestry."

"Two features make the Laramie fauna appear more ancient than the Puerco: first, the non-development of an internal cingulum, which is common in the Puerco; second, the entire absence of the hypocone, which is quite strong in some Puerco mammals. On the other hand, the upper and lower molars of Types represented in figs. F, G, I, Cl, respectively, are analogous to Ectoconus, Dissacus, Diacodon, aud Haploconus of the Puerco."

"The zoological affinities of this fauna are at present hard to determine. *Ptilodus* and *Meniscoëssus* are still provisionally referred with the Multituberculates to the Monotremes. *Thlæodon* exhibits a jaw without an angle, and with a surprising resemblance to that of *Polymastodon;* the jaw is certainly neither of the typical placental nor of the marsupial type; this animal may therefore be provisionally considered a trituberculate Monotreme."

"The placentals and marsupials, and the question whether one or both of these orders is represented in this fauna, is still unsettled. Not a single jaw has been found or reported sufficiently complete in the delicate region of the angle to determine positively its placental or marsupial structure. Portions of the jaws which are preserved indicate the presence of the marsupial type of inflection, while others point to distinct placental angulation." (Bull. Am. Mus. Nat. Hist., Vol. 5, 1893.)

Ancestors of the Tapir.—In describing two new species of Protapirus, *P. obliquidens* and *P. simplex*, from the Lower Miocene of Dakota, Messrs. Wortman and Earle take occasion to discuss the phylogeny of the Tapiridæ and thus summarize the points brought out by the descriptions:

"1. We consider the genus Systemodon as standing in ancestral relation to the Tapiridæ.

"2. *Isectolophus latidens* is probably the line leading to the true Tapirs.

"3. If further discovery shows that *I. annectens* has both the last two premolars as complex as the true molars, it must be removed from the main tapir line.

"The earliest member of the subfamily Tapirinæ, or true Tapirs, is found in the Phosphorites of France, there being a considerable interval between the latter formation and the Oreodon Beds of the White River Miocene.

"5. In contrast with the other Perissodactyla of the White River formation, the premolars of *Protapirus* have not assumed the complexity of the true molars.

"6. The foot structure of Protapirus is nearly as far advanced in its evolution as that of the existing American tapir." (Bull. Am. Mus. Nat. Hist., Aug., 1893.)

Geological News,–ARCHEAN–According to Prof. G. H. Williams, volcanic rocks are widely distributed through the crystalline belt of eastern North America. The writer limits the term *volcanic* to effusive or surface igneous rocks, in contrast to such as have solidified beneath the surface. The areas of these ancient volcanic rocks now known fall roughly in two parallel belts; the eastern embraces exposures in Newfoundland, Cape Breton, Nova Scotia, Bay of Fundy, Coast of Maine, Boston Basin and the central Carolinas; the western belt crosses the Eastern Townships and follows the Blue Ridge through Southern Penn-

sylvania, Maryland, Virginia, North Carolina to Georgia. (Journ. Geol., Vol. II, 1894.)

Paleozoic—A remarkably well preserved Lepidodendron from E'snost near Autun is described by M. B. Renault under the name *Lepidodendron esnostense.* The specimen shows the stem, leaves, fructification and roots. Attached to the rootlets are small ovoid bodies supposed by the author to be the eggs of an aquatic insect, to which he gives the name *Arthroon rochei.* These same bodies have been observed upon *L. rhodumnense,* found near Combres (Loire), and described by M. Renault some fifteen years ago. (Rev. Sci., Feb., 1894.)

Mr. J. M. Clarke reports the discovery of a perfect specimen of the extreme apex of an Orthoceras, showing the nature of the protoconch. The fossil was found in the Styliola limestone of the Genesee shales, on Canandaigua Lake, New York, in an association of species which represents the earliest appearance in North America of the fauna of *Goniatites intumescens* Beyrich. The specimen consists of the apical chamber, to which the protoconch is attached. The upper end of the specimen shows the first septum to be circular and with a central sipho. The lateral walls of the first chamber taper rapidly to the plane of conjunction with the protoconch, and its depth is about one half that of the latter. The protoconch itself is semi-ovoid in shape, and when pared with those of Orthoceras previously described or figured [in the shrunken condition] is of very large size. It shows no indication of shrinking and its distal extremity is perfectly smooth. The length of the entire specimen is .85 mm.; that of the protoconch, .60 mm.; and the diameter of the first septum 1 mm. (Am. Geol., Vol. XII, 1893.)

Mesozoic.—From a study of the fossil mammalia of the Stonesfield slate, Mr. E. S. Goodrich concludes that the primitive mammalian molar was probable tritubercular, and that the triconodont type was derived from it by degeneracy, contrary to the views of Cope and Osborn who assume that the primitive mammalian molar was represented by a simple reptilian cone which subsequently acquired a cusp in front and behind giving the Triconodont type, from which the Tritubercular type was derived. (Quart. Journ. Micros. Sci., Vol. 35.)

Mr. R. Lydekker figures and describes a new carnivorous Dinosaur from the Oxford Clay of Peterborough. The specimen comprises the anterior and posterior extremities of the left ramus of the mandible, and represents one of the Thecodontosauridæ. Since it differs from the described genera by the marked deflection of the mandibular symphy-

sis, it is referred to a new genus, Sarcolestes, with the specific name leedsii. (Quart. Journ. Geol. Soc., 1893.)

Cenozoic.—The British Museum has lately received an extinct skate from the Lower Tertiary Limestome near Cairo, Egypt. It is described by Mr. A. S. Woodward under the name *Mylobatis pentonii.* The specimen consists of the jaws, showing the dentition, which, according to the writer is the largest specimen of Mylisbotis dentition that has hitherto reached any museum. The maximum width of the disk of this extinct species is estimated at not less than five meters. (Proceeds. Zool. Soc. London, 1893.)

MINERALOGY AND PETROGRAPHY.[1]

The Eruptive Rocks of Cape Bonita, Cal.—The eruptive rocks forming the main mass of Cape Bonita, the northern Cape separating San Francisco from the Pacific Ocean, are spherical basalts and diabases, in addition to basic tuffs. The basalt is remarkable for the great spheroidal masses that characterise it. In many places the entire rock-mass is a closely packed aggregate of large bolster-like bodies, whose cross-section is approximately circular. These consist of a compact amygdaloidal rock, made up of lath-shaped plagioclases lying in a glassy base. In all cases the rock of the spheroids is much altered, and is of the same composition in the interiors as on the peripheries of the bodies. In a few cases augite may be detected as small grains that are younger than the plagioclases, but the rock on the whole is very uniform in character. The diabase is more interesting petrographically. It is younger than the basalt and has intruded this rock. Besides the usual constituents of diabase it contains iddingsite in large, rounded, idiomorphic forms. The augite varies in color from nearly colorless to a deep violet red, the latter varieties possessing a pleochroism in yellowish green and violet red tints. A qualitative test showed the presence of titanium. Sometimes the augites of different colors are intergrown, when they are optically continuous, and not infrequently the mineral is intergrown with brown hornblende. The outlines of the iddingsite are strongly suggestive of olivine. It was one of the earliest separations from the magma, being included in the augite and in the hornblende. Its own enclosures are magnetite and chromite or picotite. In some phases of the rock both green and brown hornblende are present. Both of these are regarded as original and as of the same age as the augite, for they are frequently intergrown with the pyroxene as well as with each other. In one place the diabase is variolitic, with variolites composed of tiny brushes and crystallites of various minerals, lying in a microlitic diabasic groundmass. Iddingsite occurs both in the groundmass and in the varioles. The pyroclastic rock associated with the basalt and the diabase is probably an ash of a basaltic character. Some of its component fragments resemble closely the material of the spheroidal rock. Analyses of the rocks discussed are given by Mr. Ransome,[2] in a recent number of the University of California Bulletin.

[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

[2] Bull. Geol. Dept. Univ. Cal., Vol. 1, p. 71.

Lamprophyres near the Shap Granite Mass.—Near the Shap granite in the North of England there are numerous dykes of minette and kersantite that are believed by Harker[3] to be the dyke facies of the granite, just as fourchite and ouachitite are regarded by Rosenbusch as dyke facies of eleolite-syenite. These lamprophyres contain many rounded blebs of quartz and corroded crystals of orthoclase, both of which appear to owe their present shapes to resorption processes, since both minerals are surrounded by resorption borders. The dyke rocks are thought to be genetically connected with the granite because of their age and distribution, and because of the fact that they contain the quartz and orthoclase above referred to, and also sphene, which is a characteristic component of the granite. A study of the literature of the lamprophyres shows that these rocks are often associated with granites, and hence Harker believes that the group may be discovered to be genetically related to this group of plutonic rocks. A special feature of the lamprophyres pointed out by the author is that while the total alkalies in them is about equal in amount to the sum of the alkalies in the associated granite, the potash in the former always bears a larger ratio to the soda than it does in the latter rock. It is suggested that the granite and the lamprophyres are portions of the same magma that became differentiated by gravity. From the supernatant layer, which was acid, quartz and orthoclase separated and then settled down into the lower basic portions of the mass. These were then partially dissolved, the solution of the orthoclase accounting for the large proportion of potash in the lamprophyres. In a later paper the author[4] argues against the view of Diller and Iddings that the sporadic quartzes in certain basalts and other basic rocks are the result of crystallization under other than the normal conditions. He thinks that in all these cases the quartz may have originated as outlined above.

The Geology of Conanicut Island, R. I.—The carboniferous phyllites of Conanicut Island in Narragansett Bay are cut by a mass of coarse-grained muscovite granite porphyry that has produced contact effects in the surrounding sedmentaries.[5] The granite, which exhibits many evidences of its intrusive nature, was regarded by Dale[6] as a metamorposed clastic rock, forming the lowest member of the bedded series at this place. The phyllites near the contact with the granites

[3] Geol. Magazine, 1892, IX, p. 199.
[4] Ib. IX, p. 485.
[5] L. V. Pirsson. Amer. Jour. Sci., 1893, XLVI, p. 363.
[6] Proc. Bos. Soc. Nat. Hist., 1883, XXII, p. 179.

have been changed into hornstones and knotty schists. Besides the granites the only other intrusives cutting the slates are two dykes of minette, both of which show the effects of pressure. One of the dykes consists essentially of orthoclase and two generations of biotite. It contains also apatite and zircon and large quantities of plagioclase and calcite. In the squeezed phase of the rock the biotite has been changed to chlorite. The material of the second dyke differs from that of the first one, only in that it has been more thoroughly squeezed and consequently has suffered greater alteration.

Petrographical News.—Sears[7] finds that the porphyritic feldspar in the rock from Marblehead Neck, Mass., called by Wadsworth[8] trachyte, are anorthoclases, and that much of the feldspar of its groundmass is of the same nature, consequently the rock is a keratophyre. Analyses of the rock and of one of its phenocrysts follow:

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	H_2O
Rock	70.23	.03(?)	15.00	1.99		.24	.33	.38	4.99	4.98	.06	2.19
Felds.	65.66		20.05	tr.	tr.	.13	.67	.18	6.98	6.56		.41

The report of the State Geological Board of Michigan[9] contains brief microscopic descriptions of certain eruptive, sedimentary and schistose rocks of the Upper Peninsula by Drs. Patton and Lane. Among the former are described granites, syenites, serpentine and lamprophyres. Among the sedimentaries graywackes, quartzites and slates, and, among the foliated rocks, amphibolites and hornblende schists. The amphibolites are principally altered diabases. Quartz diabases are mentioned by Lane as existing in dykes cutting graywackes and slates that are sometimes changed on the contact into spilosites, and quartzites that are altered near the intrusive into Lydian stone. Dr. Wadsworth, in the same volume, gives an outline scheme of his classification of rocks (eruptive and sedimentary), the principles of which were first ennunciated at length in his Lithological Studies.[10]

Graeff[11] has found, in an old hand specimen of tephrite from Horberig in the Kaiserstuhl, a holocrystalline basic concretion with a structure approaching that of theralite.

[7] Bull. Mus. Comp. Zool., Vol. XVI, p. 167.

[8] Proc. Bost. Soc. Nat. Hist., XXI, p. 288.

[9] Rep. State Board of Geol. Survey for 1891-92. Lansing, 1893.

[10] Mem. Mus. Comp. Zool., 1884, XI.

[11] Versamm. Oberrh. Geol. Ver. Ber., XXVI, 1893.

A modification of the microchemical method for determining iron in minerals is given by Lemberg.[12] It consists in producing Turnbull's blue from the ferrous sulphide precipitated on the mineral in question.

Alurgite and Violan from St. Marcel.—Among the minerals from the Manganese mines of St. Marcel, Piedmont, *alurgite* and *violan* have always excited considerable interest because of their rich color and their variety. The alurgite was described by Breithaupt as a deep red mica. Penfield[13] has recently obtained a sufficient quantity of the material for study. He describes it as monoclinic in crystallization and micaceous in habit. Its cleavage plates are flexible and somewhat elastic. It is biaxial with $2\ E_{na} = 56° 32'$ (average) and its dispersion is $\rho > v$, but often plates show a uniaxial optical figure, due, as the author supposes, to twinning. The mica is one of the first order, and in spite of its dark color, its pleochroism is very slight. Density = 2.835—2.849. H = 3. Composition:

SiO_2	Al_2O_3	Fe_2O_3	Mn_2O_3	MnO	MgO	K_2O	Na_2O	H_2O	Total
53.22	21.19	1.22	.87	.18	6.02	11.20	.34	5.75	= 99.99

In the formula $H\ R_2\ (Al\ OH)\ Al\ Si_4O_{12}$, R = K and Mg OH. Alurgite is thus a distinct species, which is more nearly allied to lepidolite than to muscovite, although it is a potash mica. The alurgite is associated with a jadeite composed largely of a soda-rich pyroxene that is pleochroic in pale rose and pale blue tints. Its density is 3.257—3.382, and composition (mean of two analyses):

SiO_2	Al_2O_3	Fe_2O_3	Mn_2O_3	MnO	MgO	Ca_2O	Na_2O	K_2O	Ign	Total
54.59	9.74	11.99	1.06	.58	5.03	7.24	9.32	.24	.37	=100.16

corresponding to $Na\ R(SiO_3)_2$ in which R = Al, Fe''', Mn'''. The mineral occupies about the same position in the pyroxene group as glaucophane does among the amphiboles. In composition it agrees most closely with the chloromelanite from Mexico analysed by Damour.[14]

For purposes of comparison with this pyroxene, the author analysed a specimen of violan whose density was 3.272 — 3.237, with this result.

SiO_2	Al_2O_3	Fe_2O_3	Mn_2O_3	MnO	MgO	CaO	Mn_2O	K_2O	Ign	Total
53.94	1.00	.86	.88	.36	16.63	23.80	1.22	.05	.66	= 99.44

The figures indicate a mixture of the diopside, jadeite and acmite mole-

[12] Zeits d. deuts. geol. Ges., 1892, p. 823.

[13] S. L. Penfield. Amer. Jour. Sci. XLVI, p. 288.

[14] Bull. Soc. Min. d. Franc, IV, 1881, p. 157. Cf. also foot-note No. 30.

cules in the proportions 90.8 : 4.1 : 2.4, with the addition of 2.7% of the molecule Na Mn $(SiO_3)_2$. The mineral is essentially a blue variety of diopside, differing from the anthochroite of Igelström[15] and from the blue pyroxene of Merrill and Packard.[16]

Zonal Plagioclase.—Herz[17] has shown by a study of the position of axial planes in successive zones of zonal plagioclase, and by the values of the respective cleavage angles, that the zonal banding in this mineral is due to the concentric growth of envelopes of different composition. The axial planes and the cleavage angles always correspond with the extinction angles in the corresponding band. It had been suggested by Grosser that the regular decrease in the extinction of the shells of a zonal plagioclase is due to difference in the orientation of the successive envelopes and not to a difference in their chemical composition. Herz's work proves conclusively that the decrease in the value of the extinction is not due to differences in orientation of the same chemical substance.

Hercynite in Gabbro.—Small octahedra and large irregular masses of the green spinel hercynite occur in an altered gabbro at Le-Prese, in the Valtellina, Switzerland. According to Linck,[18] it is found as irregular granular masses within the rock, and as small octahedral crystals enclosed in its plagioclase and associated with corundum sillimanite and biotite. The spinel includes small quantities of biotite, small plates of ilmenite, resembling the plates in hypersthene, a little pyrite, etc. An analysis of tolerably pure material yielded :

SiO_2	Al_2O_3	Fe_2O_3	MgO	FeO		Total
1.59	59.62	3.10	9.38	25.30	=	98.99

which corresponds to (Fe Mg) Al_2O_4 in which Fe : Mg = 3 : 2.

Optical Constants of Topaz.—Four Japanese topaz crystals and one crystal of the same mineral from New South Wales are described by Hahn,[19] and some of the optical constants of the former have been determined. One of the crystals from Otamjama near

15 AMERICAN NATURALIST, 1890, p. 74.
16 Ib., 1892. p. 848.
17 Min. u. Petrog. Mitth. XIII, p. 341.
18 Sitzb. d. Kön-preuss. Akad. d. Wiss. zu Berlin. Phys.-Math.-Classe., 1893, p. 47.
19 Zeits. f. Kryst., XXI, p. 334.

Kioto, has the following refractive indices and optical angles for yellow light: $\beta = 1.6182$, $\gamma = 1.6252$, $2\,V = 62° 40'$, $2\,E = 114° 31'$. The crystal from New South Wales has $2\,E = 113° 18'$.

Mineralogical News.—Stöver announces the discovery of fine *celestites* in the Jurassic schists of Brousseval in France. Their axial ratio is .7803 : 1 : 1.2826, and index of refraction for sodium light = 1.6235. The crystals are one centimeter in length, and are elongated parallel to $\breve{a}$. Similarly habited crystals occur also in the marl of Ville-sur-Sault. The axial ratio of these is .7806 : 1 : 1.2797, and density = 3.991.

Rheineck[20] has made another attempt to calculate from the published analyses general formulas for *tourmaline* that will not only represent the composition of all varieties of the mineral, but which will also express its relationship with micas. He concludes that there are two alkaline varieties, viz.: $Al_4\,Si_3\,B\,H_3O_{15}$ and $Al_4\,Si_3\,B_2\,H_4\,O_{17}$, and two magnesium varieties, $Al_4\,Si_5\,B_2\,Mg_4O_{25}$ and $Al_4\,Si_5\,B_2\,Mg_3\,O_{22}$, by whose intermingling all other varieties are formed.

Several crystallographic observations of Baumhauer[21] are of interest. A yellow *diopside* from the Canton of Graubünden (Grisons), Switzerland, has an axial ratio $a : b : c = 1.0918 : 1 : .5879$, with $\beta = 74° 12' 15''$. *Binnite* crystals from Infeld in the Binnenthal are certainly tetartohedrally hemihedral, as the author has succeeded in finding upon them, well-developed, the planes $\frac{0}{2}$ and $-\frac{202}{2}$.

Oebbecke[22] mentions the occurrence of *topaz* with feldspar, apatite, tourmaline, fluorite, etc, at Epprechtstein and its existence in the granite of the Gregnitzgrund in the Fichtelgebirge.

The *arsenopyrite* of Weiler in Alsace occurs in an arkose from which Scherer[23] has obtained crystals sufficiently large for measurement and analysis. These crystals are prismatic in habit, and have an axial ratio $a : b : c = .6734 : 1 : 1.1847$. A mean of two analyses gave figures corresponding to Fe : S : As = 1 : .9933 : .9751.

Mallard[24] has come into the possession of some beautiful little crystals of *periclase* that were found implanted on a white compact crust produced in the culcination of some of the Stassfurt materials.

Several twins of *aragonite* from the tunnel of Neussargues in Cantal,

[20] Zeits. f. Kryst., XXII, p. 52.
[21] Ib., XXI, p. 200.
[22] Ib., XXII, p. 273.
[23] Ib., XXII, p. 62.
[24] Bull. Soc. Franc. Min., XVI, p. 18.

France, are reported by Gonnard[25], and some fine crystals of *pinite*[26] from Issertaux, near St. Pardoux in the Auvergne.

Miscellaneous.—In his development of the theory of the constitution of the *micas*, Clarke[27] has reached the problem of the lithium members of the group. This he solves by supposing lepidolite to be an admixture of the simple molecules $Al\ F_2\ Si_3\ O_8\ R_3'$, in which R′ is principally lithium, and $Al_3\ (SiO_4)_3\ R_3'$, in which R_3' may be either K_2H or KH_2.

Retgers[28] suggests molten phosphorus and a solution of phosphorus in CS_2 as media for use in determining the indices of refraction in highly refracting substances. A tiny fragment of the phosphorus may be melted between two object-glasses, when it spreads as a thin sheet between them, and, upon cooling, remains transparent. Its refractive index is 2.144. That of a saturated solution of the substance in CS_2 is 1.95.

Some time ago, Damour[29] suggested the name *chloromelanite* for one of the varieties of jade found in ancient implements. He discovers now that the material contains garnets and pyroxene. It thus resembles the rock eclogite. The pyroxene from a Mexican specimen is composed as follows:

SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Na_2O		Total	Sp. Gr.
56.57	17.21	8.86	4.44	2.12	10.70	=	99.90	3.37

Nordenskjöld[30] has begun the study of snow crystals. The first contribution to his discussion is a series of handsome photographs of a large variety of flakes, including prismatic, stellar and other forms some of which contained liquid enclosures at the time of their fall.

[25] Ib., XVI, p. 10.
[26] Ib , XVI, p. 16.
[27] Bull. Am. Chem. Soc., XV, May, 1893.
[28] Neues Jahrb. f. Min., etc., 1893, II, p. 130.
[29] Bull. Soc. Franc. Min., XVI, p. 57. Cf. also foot-note No. 14.
[30] Ib., XVI, p. 59.

BOTANY.[1]

What is Mycoderma?—1. In my papers on the yeasts, I have mentioned the doubtful position of the sprouting fungus *Mycoderma* which morphologically and systematically stands near to the *Saccharomycetaceae*. From the latter, it is easily distinguished on account of its high refractive power, the cells being also rectangular, not spore-bearing, and very apt to aggregate in masses, or in a film. When beer, wine, or other sugar-containing liquids are exposed to the air, the *Mycoderma* will very soon form a gray, greasy looking, uneven film on the surface of the liquid. Hitherto, it was supposed that this fungus could not form alcohol; Lasché has, however, found four species which yield ½ to 2½ vol % of alcohol (See Der Braumeister, Chicago, 1891, No. 7); Winogradsky found that the morphology of the cells changes according to the amount of organic material given in a constant solution of inorganic nutritive matter. (See Centralbl. f. Bakteriol. u. Paras., 1884, p. 164). Lately, F. Lafar showed that at least one species will produce acetic acid. (Ibid, XIII, p. 684–697 1893, w. pl.).

In 1879 Hansen expressed his opinion that there were undoubtedly more than the two species—*M. cerevisiae* and *M. vini*—described by Pasteur (Studies on fermentation, pp. 77, 110, pl. IV) in existence. These two named species cannot be distinguished from each other, and they must be regarded as synonyms to all the species—at present 7—known. The macroscopic appearance of these fungi was mentioned in the January No. of the *American Monthly Microscopical Journal.*

2. The name *Mycoderma* was given by Pasteur to the bacterium of acetic fermentation. As far back as 1834, Kützing determined the vegetable nature of this ferment; he named it *Ulvina aceti.* Pasteur (See Etudes sur la vinaigre) and Turpin took the question up again, and studied the morphology of the organism. In 1879, Hansen found a new species which assumes a blue color with iodine or IKa., while the other species became yellow when thus treated. He found, lately, still another species which is also colored blue with iodine, namely, the species *kützingianum.* The genus-name was, on the suggestion of Zopf, changed into *Bacterium.* (See Berichte der Deutschen Botanischen Gesellschaft, 1893, p. (69–73). Three species of acetic fermentation

[1]Edited by Prof. C. E. Bessey, University of Nebraska, Lincoln, Nebraska,

bacteria are thus known at present, namely, (1) *Bacterium aceti* (Kütz.) Zopf, (2) *B. pasteurianum* Hansen, and (3) *B. kützingianum* Hansen. The cardinal temperatures are: Minimum for (1), 4°–5° C; for (2), 5°–6° C. Maximum is for all of them 42°–43° C, and optimum 34° C.

Morphologically, these species consist of (1) long cells, (2) swollen cells, and (3) chains of short bacula. By 40° C–40°, 5 C pure cultures were in good development, during which some of the cells of the chains grew very long, and in twenty-four hours, there was a typical vegetation of long cells, totally different from the original culture. If this new culture is exposed to a temperature of 34° C, the original chains are again formed. The long cells measured 200μ and more; by 34° C; they first swell in one or more places, sometimes assuming ball shape (diam. 11μ), then they are divided into typical chains. Nägeli regarded the long and the swollen cells as abnormal forms.

When we speak of the influence of outward agencies upon the life-activity of organisms like those mentioned above, we have generally described the influence in its action only upon *one feature* of such activity. It is not at all sure that the cardinal temperatures of *fermentation* are identical with those of the *life* of the yeast, or with those of the *cell-division* or *spore formation* of the latter. We know that the cardinal temperatures of germination, transpiration, respiration, assimilation, geotropism, heliotropism, hydrotropism, rheotropism, etc., etc., in "higher" plants are not always identical. In the instance mentioned above, we see that the *cell-division* has its cardinal temperatures, a conclusion which we may draw from the observations. We further see that bacteria are more polymorphus than is suspected, and that a new road is open for investigation which doubtless will tend to broaden our knowledge of microörganisms and of many important physiological questions.

J. CHRISTIAN BAY.

The so-called "Russian Thistle."—It is the fate of few weeds to reach so suddenly such great notoriety as that recently attained by *Salsola kali* L. var. *tragus* DC., the so-called "Russian Thistle." If one turns to any of the botanical manuals he finds no plant under this common name. He will find the "Common Saltwort." of the "sandy shore, New England to Georgia" described in such mild terms as to give no idea of the weed as it appears to the farmer upon the western plains.

The species is a native of mountainous regions in both hemispheres.

In Europe it occurs from Spain to France, Belgium, Holland, Great Britain, Ireland, Denmark, Norway and Sweden, and along the Mediterranean coast of France, Italy, Greece and Turkey. Even the sandy tracts of interior countries are not free from it; thus it is found in Germany, Austria, Hungary and Russia. It occurs also in temperate Asia. In America as stated above, it extends from New England to Georgia. The variety is apparently much less widely distributed, but the exact limits of its geographical range are not well defined, most recent authors not regarding it as sufficiently distinct to warrant separate treatment.

The technical description of the variety (to which alone the name Russian Thistle is applied) as drawn up by L. H. Dewey of the United States Department of Agriculture, is as follows:

"*Salsola kali* L. var. *tragus* DC. Prod. XIII, 2, 187 (1849). Herbaceous, annual, diffusely branching from the base, usually densely bushy at maturity, .5 to 1 m. high and twice as broad, smooth or slightly hispid; root simple, dull white, slightly twisted near the apex; leaves alternate, sessile; of the young plant deciduous, succulent, linear or subterete, 3 to 6 cm. long, spiny-pointed, and with narrow, denticulate, membranaceous margins near the base; leaves of mature plant peristent, each subtending two leaf-like bracts and a flower, at intervals of 2 to 10 mm., rigid, narrowly ovate, often denticulate near the base, spiny-pointed, usually striped with red like the branches, 6 to 10 mm. long; bracts divergent, like the leaves in size and in all respects but position; flowers solitary and sessile, perfect, apetalous, about 10 mm. in diameter; calyx membranaceous, persistent, enclosing the depressed fruit, usually rose colored, gamosepalous, cleft nearly to the base into five unequal divisions about 4 mm. long, the upper one broadest, the two next the subtending leaf next in size and the lateral ones narrow, each with a beak-like, connivent apex, and bearing midway on the back a membranaceous, striate, erose-margined wing about 3 mm. long, the upper and two lower ones much broader than the lateral ones; stamens 5, about equalling the calyx lobes; pistil simple; styles 2, slender, about 1 mm. long; seed 1, obconical, depressed, about 2 mm. in diameter, dull gray or green, exalbuminous, the thin seed-coat closely covering the spirally-coiled embryo; embryo about 12 mm. long with 2 terete cotyledons."[2]

Salsola is one of the prominent genera of the family *Chenopodiaceæ*, and is the most important member of the tribe *Salsoleæ*. Its forty spe-

[2]Bulletin 31, Agricultural Experiment Station of the University of Nebraska, Dec. 1893.

cies are very widely distributed in Europe, Asia, North and South Africa, America and Australia.

The Russian Thistle appears to have come to this country in flaxseed imported directly from Europe to South Dakota seventeen or eighteen years ago. For a while it was popularly supposed that the Russian settlers in South Dakota had purposely brought it for use as a forage plant, but this is now generally discredited. The name "Russian Thistle" is, however, so well fixed that it will continue to be used in spite of its inappropriateness, just as we say "Canada Thistle" for another Old World weed.

For a number years after its introduction it attracted little attention, and it was not until seven or eight years ago (1886) that it began to be troublesome in South Dakota. Since this time it has spread with much rapidity. Both of the Dakotas are now badly overrun with it. A few years ago it invaded Nebraska, coming into the State about Valentine, and in Knox, Cedar and Dixon Counties. It probably came to the first named place with the United States soldiers stationed at Ft. Niobrara, a few miles east of the town of Valentine. The frequent transfers of troops from forts in South Dakota afford ready means of transportation to weeds of this nature. For several years it has been spreading from this point. The counties mentioned are separated from South Dakota by the Missouri River, but here and there are ferries over which teams frequently pass, and at these points the Russian Thistles are very abundant.

The railroads have aided materially in their distribution, as is shown by the fact that by the end of 1893, Russian Thistles were to be found in nearly all parts of Nebraska, and in nearly all cases they were at first confined to a narrow belt along the track. Year by year they spread from this belt, moving most rapidly along the lines of greatest travel. The wind, also, is an efficient agent in spreading them, since in many cases, the nearly spherical plants are broken off at the root, and rolled for long distances as "tumbleweeds," scattering their seeds throughout their course.

In Minnesota, Iowa and Wisconsin, Russian Thistles have appeared, and here again they have been brought in by the railroads. The reason why the railroads have had so much to do with the distribution of this weed, is that finding by the side of the tracks much unsodded ground, they spring up here in great numbers, and in the fall when they break off by the winds they are caught up the passing trains and carried away on the trucks or steps of the cars or on the pilot or in the machinery of the engine.

The states of the Plains, the Dakotas and Nebraska, and those next adjacent, have taken steps to warn their people of this invading weed by bulletins and through the public press. The United States Department of Agriculture sent an agent to inspect the invaded region, and issued a special bulletin on the subject. The Russian Thistle is a common topic for papers and discussions before Agricultural and Horticultural Societies, farmer's institutes, farmer's clubs, alliance meetings, etc. It will soon be so well known upon the Plains that it will no longer be allowed to grow unmolested because unrecognized.

CHARLES E. BESSEY.

ZOOLOGY.

Reproduction of the Foraminifera.—Fritz Schaudinn has studied this little known subject and presents[1] these results: The reproduction is effected by the division of the protoplasm into, in different individuals, a varying number of pieces which secrete shells and grow into the adult after different methods according to the species. The following modifications of the process are noted:

I. The division of the protoplasm, the assumption of form, and the secretion of the shell by the pieces is completed within the shell of the mother. The embryos then leave the mother either, through the mouth, or, when that is too small, by a breaking through the shell. II. The division occurs inside the mother shell and the embryos escape as naked plasmodia, to develop the shell outside. III. The protoplasm leaves the mother shell as a connected mass and all processes occur outside the old shell. In all cases the mother, before reproduction, is polynucleate, the embryos are usually uninucleate but in some cases 2 or 3 and rarely more nuclei are present.

Schaudinn further calls attention to a peculiar type of nuclear multiplication which he finds common in this group but which has hitherto escaped notice. He has never seen division into two daughter nuclei, but in all forms studied, after a series of changes the mother nucleus divides into many daughter nuclei. Briefly summarized these changes are as follows: Through the absorption of fluid the homogeneous mother nucleus becomes vesicular and then inside this, by means of an achromatic filament apparatus, an equal division of the whole nuclear substance (chromatin and achromatin) into numerous portions follows, and these by disappearance of the nuclear membrane pass freely into the cytoplasm and become independent nuclei.

Regeneration in Hydroids.—Dr. C. B. Davenport attacks[2] one aspect of the problem of regeneration. One of the fundamental assumptions of theories of heredity is that regeneration, like development from the egg depends upon the pre-existence of embryonic tissue but a disputed point is whether embryonic tissue is qualitatively different in different parts of the body, *i. e.*, whether it can produce only certain definite and distinct things or whether it is potentially the same

[1]Biol. Cblt. XIV, 163, 1894.

[2]Anat. Anzeiger IX, 283, 1884.

and the different results depend on agencies outside the developing cells. This he applies to the regeneration of lost parts in Obelia, by by cutting off the hydranths and their stalks at different levels. His conclusions are:

"First. The regenerative tissue is not differentiated at different levels to produce different things independent of environment; but on the contrary, the embryonic tissue at all levels may produce the same things.

"Second. Wholly aside from the production of definite things, there may be acquired in certain embryonic tissues a usual method of development, independent of environment. * *

"Third. The curves of regeneration bring out a second wholly unexpected series of facts; namely, the tendency of regenerative tissue at all levels to produce preferably certain forms. * * * "

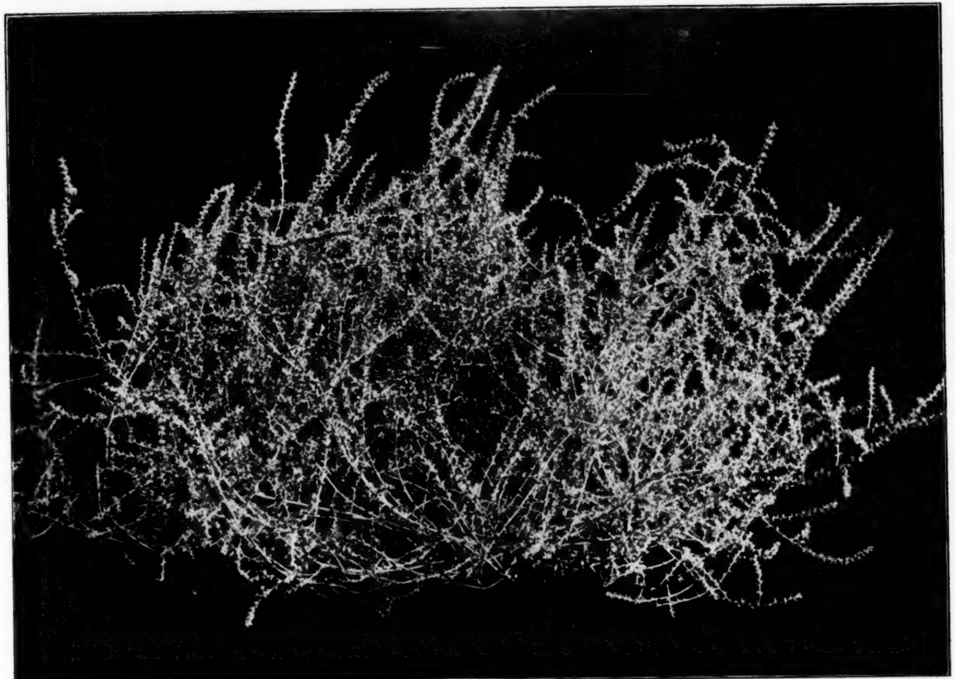
Closely allied to these observations of Davenport are some by Albert Lang[3] who, working under the direction of Professor Weismann, claims that in certain hydroids, notably in Hydra, Eudendrium and Plumularia, both germ layers do not participate in the formation of the buds but that these structures proceed from the ectoderm alone which by a sort of multipolar gastrulation forms the entoderm of the bud, and is to be regarded as the sole foundation of the daughter individual. Accompanying this paper is a note by Prof. Weismann stating that the facts observed by Lang were just such as he had predicted upon theoretical grounds.

Shortly after the publication of Lang's results, his experiments were gone over by an American student who found that while he could easily duplicate Lang's figures, the conclusions based upon them were due to errors of misinterpretation and that in reality both layers do participate in the bud formation. These results have not been published. This is, however, the less to be regretted since Dr. F. Braem of Breslau has recently gone over the whole matter and he announces[4] that Lang's account is all wrong. He finds nothing which will support Lang's conclusions, there is no fusion of one germ layer with the other and never a proliferation of cells of the ectoderm of the parent to form the entoderm of the adult.

The Parietal Eyes.—Those who have kept close watch of the progress of our knowledge of the "pineal gland" can but be interested in some recent papers. Long believed to be a gland and by

[3]Zeitsch. f. wiss. Zool. LIV, 365, 1892.
[4]Biol. Cblt. XIV, 140, 1894.

PLATE X.



Russian Thistle, about one-sixth natural size, from one of the streets bordering the city park of Lincoln, Nebraska.

Descartes assigned as a proper sized organ for the residence of the soul, this structure was first pointed out by de Graaf and Spencer, almost simultaneously, as a veritable visual organ in process of disappearance. After their papers the literature of the organ grew rapidly until the veteran histologist, Leydig, announced that it was not an eye; and since he had been the first to suggest that the structure was sensory his final dictum, finely illustrated, naturally had weight. Then Beranek showed that there were two organs confused, an anterior eye and a posterior vascular or glandular structure. The two recent papers to which we have referred throw no little light upon the matter. Prof. W. A. Locy has described[5] the early phases of the eye in the Selachians and he further shows that the early optic pits are but one of three serially homologous pairs of structures which differ in their early stages only in the matter of size. The posterior pairs are traced into the optic outgrowth. In the second paper Klinckowström[6] gives a number of facts regarding the structure of the parietal organs in the South American Iguana and Tejus which in connection with the work of Locy and Beranek tempt one to indulge in speculation. With what Klinckowström has to say of the parietal eye proper we have little to do. It is rather with the secondary structures. There are in Iguana two distinct phases to the epiphysial outgrowth. In the first the parietal eye proper is cut off from its connection with the cerebral cavity thus forming the eye and the epiphysis. Next, the distal portion of the epiphysis takes on a histological character closely approaching that of the parietal eye, the deeper portion retaining its former conditions, and a constriction tends to separate this from the rest. Klinckowström naturally considers this as the temporary appearance of a second epiphysial eye. In connection with Locy's observations and especially when taken in connection with Klinckowström's further observation that there is a second nerve developed in position for this outgrowth, the conclusion is inevitable that the ancestor of the vertebrates had not three eyes but at least three pairs of eyes. As is well known the parietal nerve is not median but on one side. In some cases he found one on either side, showing that the lack of symmetry is due to a failure to develop on the part of one of the nerves. One of Klinckowström's conclusions seems a little questionable. He concludes that the parietal nerve is not strictly comparable to the optic nerve, the point apparently being that in the one case the nerve follows the optic outgrowth while the parietal nerve does not,

[5]Jour. Morphol. IX, 115, 1894. See also Anat. Anzeiger.

[6]Zool. Jahrb. Abth. Anat. VII, 249, 1894.

but enters the roof of the brain in the region of the habenular ganglion. This difference does not strike one as forcibly as a little while ago. The recent investigations of Keibel and Assheton have shown that the optic stalk is not the optic nerve, but this stalk merely forms the tract through which the true nervous elements grow inward from the retinal layer. This being the case it is easy to see that possibly in the case of the parietal nerve the outgrowth has been through other tissue.

East African Reptiles and Batrachia.—The U. S. National Museum has recently received some valuable collections of Reptiles and Batrachia from Eastern Africa and the adjacent islands and these have now been studied by Dr. L. Stejneger.[7] Among the interesting facts brought out is a better knowledge of the fauna of the Seychelles. Wallace, in his "Island Life," enumerates 11 species as found in these islands of which five are considered as peculiar to them. To-day, fifteen species of Reptiles and Batrachia are known with certainty, plus several more doubtful, as coming from these Islands and of these ten are not known from any other locality. Ten of these species are represented in the museum collections. The new species described in this paper are *Diplodactylus inexpectatus* (Seychelles), *Phelsuma abbotti* (Aldabra), *Eremias sextæniata* and *E. hoehnelii* (Tana River, E. Af.), *Mabuya chanlerii* (Tana R.), *Ablepharus gloriosus* (Gloriosa Is.), *Typhlops mandensis* (Manda Is.), *Simocephalus chanlerii* (Manda), *Causus nasalis* (West Africa), *Hypogeophis alternans* (Seychelles).

On the Iguanian genus Uma Baird.—This genus has been hitherto represented by but two specimens, and has been hence but little known. Professor Baird in his original description in 1852 did not adduce any character sufficient to distinguish it from Callisaurus Blv., and it was not until 1866 that I pointed out that the difference consists in the possession by Uma of a series of elongate free scales on each side of the digits, and on the external side of the sole, which are wanting from Callisaurus. I noted the occurrence of the genus near Tucson, Arizona, as represented by a second and adult individual; the type, a young animal, having been taken on the Mojave Desert. Since that time no additional material has come under my observation.

A renewed examination of these two specimens has shown me that they belong to two very distinct species. I accordingly name the Tuc-

[7]Proc. U. S. Nat. Mus. XVI, 711, 1893.

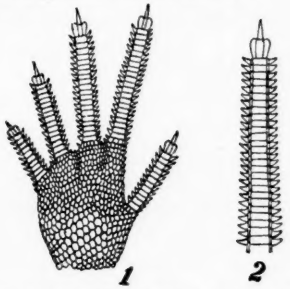
son species *U. scopifera*, and give the following differential diagnoses of the two.

UMA NOTATA Baird. Femoral pores 17–18; labial scales nearly flat; fringes of the inferior eyelid longer than those of the superior; occipital plate larger; digits longer, with shorter fringes of spines; colors pale.

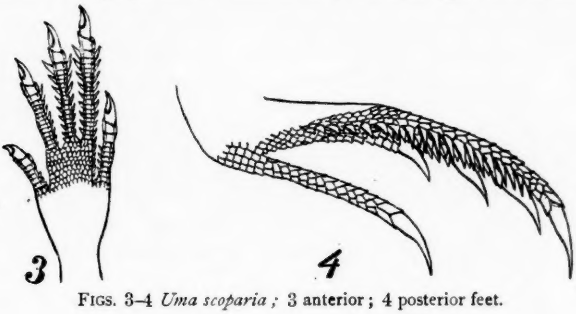
UMA SCOPARIA Cope. Femoral pores 30 in one row, with a second row of 12; labial scales strongly keeled; fringes of eyelids equal; occipital plate smaller; digits shorter, with longer fringes of spines; ground color above black, marked with closely placed discoidal light spots with a black center. (No. 6065 U. S. National Museum).

The fringed digits and sole of this genus constitute an excellent example of homoplassy. Similar fringes are present in the same positions in the Asiatic Agamid genus Phrynocephalus, and in the African Gecconid genus Ptenopus. Both of these, like Uma, are inhabitants of deserts. The spines which compose the fringes penetrate the sand, and give the animal a better hold on it than is secured by the ordinary squamation.

I give figures of the feet of *Ptenopus garrulus* Smith and *Uma scoparia* in illustration of this point.—E. D. COPE



FIGS. 1–2 *Ptenopus garrulus;* 1 anterior foot; 2 anterior digit; from Boulenger.



FIGS. 3–4 *Uma scoparia;* 3 anterior; 4 posterior feet.

On the Genera and Species of Euchirotidæ.—Professor Alfredo Dugés of Guanajuato, Mexico, has sent me an ms. description of a new Amphisbænian from the state of Guerrero, Mexico, which is allied to Bipes (Chirotes Cuv.), but which possesses but three digits, and presents various other differences from the *B. canaliculatus*,

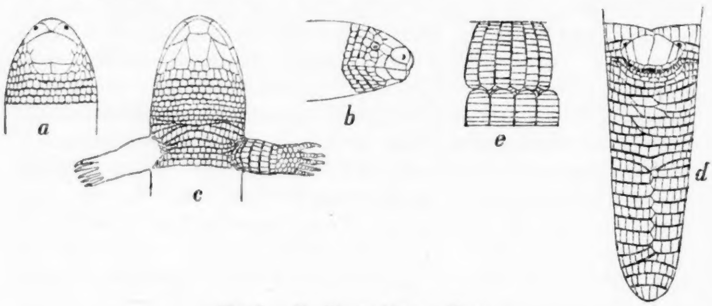


Fig. 5.—*Euchirotes biporus*, Cope.

including a much shorter tail. In endeavoring to determine its relationships with the known species of Bipes, I find that the individuals from Cape St. Lucas, Lower California, which I have hitherto assumed belong to the *Bipes canaliculatus* Lacép. really represent another species and genus. I now offer diagnostic characters of these forms, preliminary to a fuller notice in my forthcoming Scaled Reptiles of North America.

Digits five, all clawed ;	*Euchirotes* Cope.
Digits five, one smaller and clawless ;	*Bipes* Lacép.
Digits three, clawed ;	*Hemichirotes* Dugés.

Each of these genera includes a single species, which are characterized as follows.

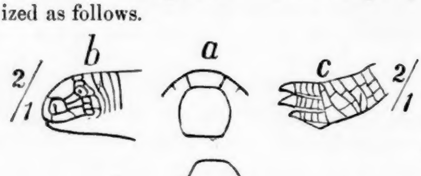


Fig. 6.—*Hemichirotes tridactylus*, Day.

Euchirotes biporus Cope, sp. nov. Tail twice as long as head; anus preceded by a transverse series of six large plates, which extend to the abdominal scuta; a single preanal pore each in a single scale in front of the external preanal plate. Nasal plates nearly in contact in front. Cape

St. Lucas, Lower California. U. S. National Museum; G. Eisen.

Bipes canaliculatus Lacép. Tail twice as long as head; preanal scuta small, preceded by a transverse row of small scales, each of which is perforated by a pore. Nasal plates well separated in front. Mexico.

Hemichirotes tridactylus Dugés. Tail but little longer than head. Anus preceded by six plates of moderate size, and these by only two pore-bearing scales on each side. Nasal plates widely separated by contact of rostral and internasal. Guerrero, Mexico; A Dugés.

Stejneger has shown that the name Chirotes Cuv. must be abandoned in favor of Bipes Lacép. of much earlier date. As the family name Chirotidae has become engrafted on our literature, I propose to retain the name Euchirotidae in place of it for the family, so as to disturb the existing custom as little as possible.

Explanation of Cuts.

Fig. 5.—*Euchirotes diporus* Cope, twice natural size.

Fig. 6.—*Hemichirotes tridactylus* Dugés, twice natural size.

Letters; *a* head from above; *b* profile; *c* from below, with fore limbs; *d* tail from below; *e* side of body; *f* profile of tail; *g* rostral plate from front.

E. D. Cope.

Zoological News.—Protozoa.—Blochmann again replies[8] to the oft asked question, Does the contractile vacuole empty to the exterior? in the affirmative.

F. Schaudinn has studied the *Gromia desjardinii* of Max Schultze and finds[9] that it differs from Gromia in many respects and he proposes for it the generic name of Hyalopus. He has studied its reproduction and finds that transverse fission of both animal and shell occurs, the process requiring about three weeks for completion, the mouths of the new individuals being formed in the cut ends of the shell. Similarly division into three has been noticed. Besides, he has seen in six cases the formation of swarmspores. From five to twelve hours before the formation of the spores the pseudopodia are retracted and the whole protoplasm divides into spherical portions each of which contains a large nucleus. Each of these becomes amœboid and then develops a large flagellum. After some other phases these swarmspores copulate in pairs. The history has not been followed farther.

[8]Biol. Centralblatt XIV, 82, 1894.

[9]Stzber. Ges. Naturf. Freunda Berlin, 1884, p. 13.

Mollusca.—Dr. R. E. C. Stearn's recent paper, "Notes on recent collections of North American land, freshwater and marine shells received from the U. S. Department of Agriculture,"[10] adds considerably to our knowledge of the distribution of several species of Molluscs. No new forms are described.

Vertebrata.—H. H. Wilder points out[11] that in the adults of *Desmognathus fusca, D. ochrophœa, Plethodon erythronotus* and *Gyrinophilus porphyriticus*, lungs and trachea are completely absent, respiration taking place by the external skin.

Biétrix claims[12] that in the branchial lamellæ of sharks and teleosts the blood is contained in a system of lacunæ, which, from their lack of membrana propria and endothelium, cannot be regarded as capillaries.

Heinrich Ernst Zeigler studied the yolk nuclei of fishes some years ago. He now returns to the subject and brings[13] new evidence to support his previous thesis that after the close of segmentation the meganuclei of the yolk of sharks and teleosts contribute nothing to the development of the embryos.

Dr. T. H. Bean describes[14] a new genus and species of Blennoid Fish under the name *Plagiogrammus hopkinsii.* The type was collected with other fishes intended for the aquaria at the World's Fair at Monterey, Cal. In confinement it hides in rock crevices and seldom ventures from its place of concealment. It is about 6 inches in length.

Dr. L. Stejneger describes[15] a new species of blind-snake from the Congo region of Africa under the name *Typhlops præocularis.*

Robert Ridgway records[16] as new *Geothlypis poliocephala ralphii* coming from the Lower Rio Grande Valley, the type being found at Brownsville, Texas.

Mr. F. W. True regards Taylor's mouse (*Sitomys taylori*) as presenting such combinations of characters as to warrant its being regarded as the type of a new subgenus to which he gives[17] the name Bæomys. He also describes (l. c. p. 689) a new species of Sitomys (*S. decolorus*) from Honduras.

[10]Proc. U. S. Nat. Mus. XVI, 743, 1894.

[11]Anat. Anzeiger IX, 216.

[12]C. R. Soc. Philomath Paris, Jan., 1894.

[13]Ber. Naturf. Gesell. Freiburg, VIII, 192, 1894.

[14]Proc. U. S. Nat. Mus. XVI, p. 699.

[15]Proc. U. S. Nat. Mus. XVI, 709.

[16]Proc. Nat. Mus. XVI, p. 691.

[17]Proc. U. S. Nat. Mus. XVI, 758.

EMBRYOLOGY.[1]

Development of Sponges.[2]—Otto Wass in a comprehensive paper describes the egg development and metamorphosis of several representatives of the Cornacuspongiae, including under this head the Monaxonida, with the exception of the Clavulina and the horny sponges. For the Monaxonida the embryonic development of *Myxilla* and *Chalinula*, and the metamorphosis of *Axinella* and *Gellius*, are described in detail. For the horny sponges, the development of *Euspongia* and *Hircinia* is outlined. In addition, there are scattered observations on many other Naples cornacuspongiae, and lastly the author presents the results of a renewed study of *Spongilla*.

A fundamental uniformity both as regards embryonic development and metamorphosis, was found to prevail throughout these sponges. The account of the metamorphosis differs but little from the author's previous account of the metamorphosis of the *Esperia* larva, and is very similar to that given by Yves Delage in his last paper (reviewed in the January NATURALIST).

In the marine monaxonida described, the segmentation is unequal. Micromeres in an epibolic fashion surround a mass of macromeres, except at the posterior pole. The micromeres become the ciliated epithelium of the larva, the macromeres constitute the inner mass. The larva thus consists of two layers. In the inner mass some of the cells remain undifferentiated, while the rest alter both in nucleus and cell body, and are collectively known as differentiated cells. Certain of these differentiated cells arrange themselves in an epithelial manner at the surface of the posterior pole. The undifferentiated cells of the inner mass become the amoeboid cells of the adult, from which the reproductive elements are developed. Thus the division into germ and somatic cells is very early brought about.

In the horny sponges the segmentation does not lead to a true morula which dilaminates into an outer layer and an inner mass, as Schulze thought. The segmentation here too is unequal, and the micromeres surround the macromeres as in the monaxonida, the former becoming

[1]Edited by E. A. Andrews, Baltimore Md., to whom communications may be addressed.

[2]Die Embryonal Entwicklung und Metamorphose der Cornacuspongien, von Dr. Otto Wass, Zoologische Jahrbücher. Abth. für Anat. und Ontogenie. Bd. VII, 2 Hft., 1893.

the ciliated epithelium of the larva, the latter the inrer mass. But in the larva of the horny sponges, as in that of *Spongilla*, the ciliated epithelium is continuous over the whole surface. This is explained by supposing that in these types the ciliated epithelium (micromere layer) completes its growth around the inner mass, which in the other sponges is left bare at the posterior pole.

In the metamorphosis of the two-layered larva of the cornacuspongiae, a complete inversion of the layers take place. The ciliated cells draw in their cilia, and migrate into the interior of the sponge where they form a compact mass, surrounded by the former inner layer. Certain of the differentiated cells of the latter layer unite to form the thin epidermis of the adult. The boundary line between the rest of this layer and the inner mass of once ciliated cells gradually disappears, elements belonging to both layers becoming distributed irregularly throughout the sponge body (process of "durchwachsung"). Groups of the ciliated cells now begin to develop into flagellated chambers. Independent spaces or lacunae appear and become gradually lined with an epithelium formed by the differentiated cells of the larval inner layer. These spaces are the canals. Connection between them and chambers is subsequently established. In two points Wass differs from Delage, in his account of the metamorphosis. Delage believes a special layer of cells, the epidermic cells, can be distinguished in the larva, which during the metamorphosis, take the place of the ciliated cells as a superficial covering. Wass finds no ground for distinguishing the cells which thus form the adult epidermis, from the other differentiated cells of the larval inner mass. Again Delage believes that during the metamorphosis the undifferentiated cells engulf, amorba like, the smaller ciliated cells, subsequently letting them go free to form the flagellated chambers. Wass disbelieves in this remarkable process, though he grants the possibility of amoeboid cells occasionally engulfing ciliated cells, which however are never after liberated, but undergo degenerative changes (i. e. are digested).

On going over the *Spongilla* development the author, aided by his discoveries in marine sponges, finds that a different interpretation in many particulars is to be put upon his earlier observations. The segmentation is not equal, but unequal. A true morula is not established, but instead the smaller blastomeres surround the larger. The ciliated epithelium of the larva is not transformed into the adult epidermis, but the inversion of layers described above takes place in *Spongilla* also. The exhalent canals and flagellated chambers are not formed as diverticula from a single main cavity, nor are the inhalent canals form-

ed as invaginations of the "ectoderm," but both sorts of canals arise as independent lacunae, subsequently acquiring an epithelium and connecting together, and the chambers are formed from groups of the immigrated cells. The development of *Spongilla* is thus brought into accord with that of the marine cornacuspongiae.

In a comparative review of the various types of sponge development, the author points out the fundamental similarity between the development of the cornacuspongiae and that of the calcareous sponges, as exemplified in *Sycandra.* The ciliated cells are homologous in the two kinds of larva, as are the granular cells of the amphiblastula and the inner mass of the other larva. The difference in the character of the metamorphosis arises from the fact that in the amphiblastula there is a large cavity, while in the larva of cornacuspongiae there is none. In this comparison Wass and Delage agree.

The author thinks the development of those sponges (*Ascetta, Oscorella, Plaxira,* etc.), which apparently differ from the plan of development described in this paper, needs to be worked over. A fundamental harmony with the development of cornacuspongidae and *Sycandra* will be revealed.

Touching the relationship between sponges and the other metazoa the author, without dogmatizing, is inclined to believe that they had a common ancestor above the protozoa. This ancestor is represented in the two-layered larva of both. But the community of origin goes no higher than this simple form—the sponges are not coelenterates. In the two-layered ancestor of the sponges, the superficial ciliated cells migrated into the interior, resigning their function of locomotive organs in order to generate internal currents of water, made necessary by the adoption of a fixed habit of life with subsequent increase of bulk. In other metazoa, the ciliated cells continue to form the superficial covering of the body. The immigration of the ciliated cells in the larva of cornacuspongiae, and the invagination of the ciliated cells in the Sycandra amphiblastula, are the ontogenetic expression of this change of position of the ciliated cells in the early ancestors of sponges, and have nothing to do with a process of gastrulation—the two-layered embryo being already formed before the occurrence of this immigration or invagination.

H. V. Wilson.

ENTOMOLOGY.[1]

Shade Tree Insects.—Professor H. Garman[2] publishes an excellent account of the pests of shade and ornamental trees. The article is chiefly concerned with insect pests, which are roughly divided into three groups: (1) Leaf insects, (2) trunk and branch mining insects, and (3) root infesting insects. To the first group belong the largest proportion of species, the walnut-worm, web-worm, elm leaf-bettle and others being included in it. "Such insects attract attention at once from the nature of their injury, the unsightly appearance due to gnawed leaves, webbing and refuse, taking away at once from trees their practical value as shade, and their æsthetic value as ornament.

"While their injuries are not at first so apparent, the work of the boring and mining species is not less injurious, and is the more to be feared because its results are not seen until the mischief under the bark is at an advanced stage. The locust borer and the elm bark-beetle are members of this group, both species being common and injurious in Kentucky. The pine bark-beetles and the fruit bark-beetles now becoming injurious in this State may also be placed here. The greater number of species which attack the trunk are the grubs of beetles. A few are caterpillars (larvæ) of moths. The branches and twigs are injured by a host of small species, some of which girdle them, others mine them, still other species do serious mischief by placing their eggs in them, while some of the true bugs simply puncture and abstract their sap.

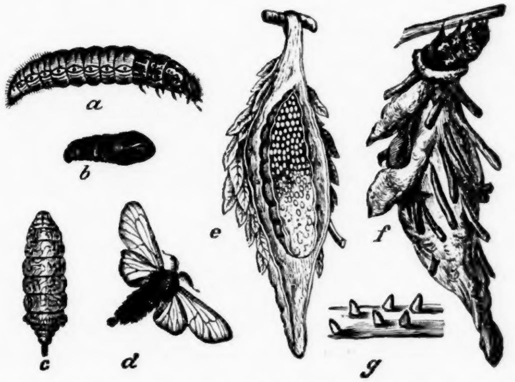
"Doubtless the number of insects which feed on the roots of shade trees is large, but the unavoidable difficulties in the way of studying their habits has prevented a very full knowledge of this group."

Mr. Garman treats of the life-histories of the species most destructive in Kentucky at some length. The bagworm is one of the first discussed. This worm "lives in and carries about with it a case made of silk, on the outside of which it fastens bits of leaves, probably to render its detection less easy to birds and other enemies. One may see these cases all through the winter adhering to the naked twigs of both deciduous and evergreen trees, the worms having taken the precaution to fasten them there by wrapping the twigs with silk. The case of a grown worm measures 1.75 inch in length and its greatest diameter is some-

[1]Edited by Clarence M. Weed, New Hampshire College, Durham, N. H.

[2]Bulletin No. 47, Kentucky Agr. Experiment Station.

what more than .50 inch. If cases are examined during the winter a large number will be found empty, these being old ones which adhere to the twigs longer than one season, or else are those which produced males. In every one which produced a female the preceding summer will be found an oblong brown cylindrical object tapering a little at one extremity, but blunt and with a ragged opening at the opposite end through which the adult insect escaped; for these are the deserted pupal skins of the female. Each appears at first to be full of a powdery material, but on removing some of this the minute soft whitish eggs will be observed packed closely so as to fill the greater part of the skin.



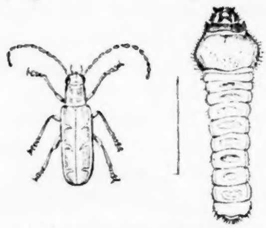
The bag-worm. *a*, larva; *b*, pupa; *c*, adult female; *d*, adult male; *e*, bag containing eggs; *f*, bag containing larva; *g*, young larvæ, with conical cases. (From Riley).

"The adult female of the bag-worm is a very singular creature, looking more like a worm than a moth, incapable of flight, having no rudiments of wings, and with only minute and functionless legs. The very scales of the greater part of her body are abortive, and are rubbed off to constitute the powdery material in which the eggs are packed. Being incapable of flight the most she can do is to wriggle down to the opening at the lower end of her case where she meets the winged mate, and then in the same manner wriggles back to her empty pupa case in which she carefully placed her eggs for safe-keeping during the winter. Finally with an astonishing solicitude for the walfare of her prospective young, she deserts the case, drops to the ground, and dies shortly afterward. Is it possible that this pulpy mass, exhausted, with nothing more to live for, with death certain and at hand, understands

that a dead and putrid body left in the case would work harm to her precious eggs? Anyway she leaves the case."

Mr. Garman photographed a member of the cases from different trees, as shown on the accompanying plate. Those marked *a* are from red cedar; *b*, from maple; *c*, from arbor vitæ; *d*, from spruce; and *e* from white pine.

An extended account of the elm borer (*Saperda tridentata*) is also given. This insect had done serious injury to some of the largest and finest elms in the city of Frankfort. The nature of the damage is well-shown in the plate reproduced herewith. Washing the bark with a mixture of whitewash and Paris green is suggested as a preventive measure.



Elm-borer: larva and adult.

Larval Habits of Brachinus.—Mr. H. F. Wickham records (in the Canadian Entomologist) finding in northern Iowa the larvæ of a species of Brachinus parasitic on the pupæ of *Dineutes assimilis*. "The larva lies in the cell of its host and extracts the juices from an opening made in one of the wing-pads; the maggot-like body is adorned, but not supported by six very soft and short legs, which can be of little service except perhaps as 'feelers' in its dark abode. The little animals were carefully watched and examined several times a day, until finally the larger one, having withdrawn nearly all the juices from the pupa and become swollen to an unwieldy size, changed after a day or two of resting into a pupa.

"How the Brachinus gets into the cell of it host, whether brought in as a young larva clinging to that of the Dineutes, or deposited as an egg by the mother is a mystery to me. When small it is more active than when larger grown, and with advanced age becomes gradually more helpless. In any case the complete adaptation to a parasitic habit is apparent in the whole structure—the soft, juicy body, unprotected by chitinous scutes, the weak legs quite useless for ambulatory purposes, and the lack of strong locomotive bristles. The appearance is almost that of some Hymenopteron, not at all resembling the strong raptoreal larvæ of the Adephaga in general."

North American Trypetidæ.—Mr. W. A. Snow makes an important addition to our knowledge of a little-studied family of Diptera

in his descriptions of North American Trypetidæ, with notes.[3] Good descriptions of a large number of new species are published, together with valuable notes on the distribution of those already known. Two new genera—Polymorphomyia and Xenochæta—are characterized. Two plates illustrate the wing markings of many species.

North American Dolichopodidæ.—Professor J. M. Aldrich in his New Genera and Species of Dolichopodidæ[4] describes five new species, and characterizes two new genera—Dactylomyia and Metapelastoneurus. He also gives a table of the species of Sympycnus.

Entomological Notes.—At a recent meeting of the Entomological Society of London Mr. S. H. Scudder "exhibited the type-specimen of a fossil butterfly—*Prodryas persephone*—found in beds of Tertiary Age at Florissant, Colorado. He said the species belonged to Nymphalidæ, and the specimen was remarkable as being in more perfect condition than any fossil butterfly from the European Tertiaries. He also said that he had found a bed near the White River on the borders of Utah in which insects were even more abundant than in the Florissant beds."[5]

K. T. Nogakushi of the Imperial University, Tokio, publishes[6] a preliminary notice of his investigations of the Spermatogenesis of *Bombyx mori.* The author distinguishes four zones in the follicles: the formative, growing, ripening, and that of metamorphosis.

At a recent London sale a specimen of *Chrysophanus dispar* sold for six pounds, ten shillings; and a pair of *Noctua subrosea* for six pounds six shillings.

In his report as Dominion Entomologist for 1893, Mr. James Fletcher discusses a large number of injurious insects affecting various Canadian Crops.

[3] Kansas University Quarterly, II, 159–174; Jan., 1894.

[4] L. c. 151–157.

[5] Ent. Mon. Mag., V, 22.

[6] Zool. Anzeiger, XVII, 20.

ARCHEOLOGY AND ETHNOLOGY.[1]

The non existence of paleolithic culture.—There appeared in the January number of THE AMERICAN NATURALIST a criticism by Mr. H. C. Mercer of my recent paper "On the Evolution of the Art of Working in Stone," which induces me to ask for space for an answer.

My paper in the *Anthropologist* for July 1893 was necessarily restricted, and, although only a preliminary one, had I thought, made some points clear in the discussion of paleolithic man which appeared to me not to have had particular attention drawn to them.

Geology, anatomy and prehistoric archeology are all of the greatest value in the study of the early history and development of the human race, but a study of the technology of archeology, I contended is equally important in determining the mechanical status of the race at any period of its existence.

(1) I contend that "Teshoa or chip-knife" making at one blow, or making a "turtle back" at twenty blows (if turtle back is all we want), may be as easy as, but is not *easier*, than hammering and grinding. The present status of archaeological information fully justifies the expression of a doubt that either a "teshoa" or "turtle back" is a completed instrument.

(2) That Pottery is recorded as found in the lower European cave strata, (and the authorities who make the assertion are fully sustained) "warrants a review of the French classification."

(3) "Why" Says Mr. Mercer "men who bored, polished and carved bone, sketched realistic designs, and chipped blades equal in make to Mexican sacrificial knives did not polish stone, seems incomprehensible. But the European museums clearly assert that no polished stone tool has been found in the caves. If true, the fact is conclusive against Mr. McGuire."

One of the chief points which my paper raised was, that the ability to do these things (bone polishing etc.) was sufficient proof of itself that those who did them could and did polish stone tools, and further, such polishing required less acquaintance with the fracture of stones, simpler tools, and less technical ability, than was necessary in chipping and flaking stone, and in scraping and etching bone, etc.

[1] This department is edited by H. C. Mercer, University of Pennsylvania.

I do not deny that the hammer was used for many different purposes, but assert that its shape proves it to be intended for stone working, and not for corn bruising.

(4) I think that this is answered under No. 1. I deny that the "Coup-de-poing" materially differs from the "turtle-back." Both are apparently unfinished implements. The "turtle-back" presents its refractory part in a ridge down the center of a proposed implement. The refractory part of a "coup-de-poing" is on its periphery, and is generally due to a knot in the stone. No two stones have the same fracture; the same stone will show a variety of fracture in a given vein.

(5) Polished implements have been found in the caves also in the clays, and in the bogs; in localities entitling them to be classed as of the quaternary period with as much claim of right as any chipped stone.

(6) Admits that pottery is not to be expected in the drift.

The admission that European cave classification requires revision carries with it the admission that it is erroneous.

I fully realize that it is considered by a very large class of archeologists as heterodox, to deny the existence of a paleolithic period. The classification of paleolithic periods into those of St. Acheul, Chelles, Mousterian, Magdalenian, etc., is demonstrably inaccurate, and needs revision and simplification. The advocates of paleolithic man assert that his mechanical development was so low, that the only stone work which he was capable of performing, was to knock flakes from stones with a few blows at most and subsequently to use them as cutting implements, by holding them in the naked hand, yet they admit that while he was in this low stage of mechanical development he was possessed of artistic attainments, and that he could and did etch or engrave the representations of animals on stone, bone and ivory and that he could at this time make the gravers and other tools which such work required.

They further assert that he went through a distinct period extending over centuries, in the gradual development of the art of chipping stone, until finally he made chipped implements of exquisite shape which cannot now be duplicated. At the time when he had scarcely learned to chip rough flakes on one side, it is shown that Paleolithic man made needles of bone with eyes carefully drilled through them, that he made bone pins and ground them, that he fashioned spear heads of bones with barbs or opposite sides, that he possessed organized government and recognized in the Batons-de-Commandment the insignia of rank; these articles being found with an arctic fauna necessitate the

admission that he was sufficiently clothed to resist the cold, if so, he must have possessed fire and shelter, all of which would require intelligence. It cannot be denied that with such weapons as he possessed, he successfully attacked a fauna more powerful, and presumably more ferocious, than any now known to man. Man cracked the bones of these animals, and had, it is asserted, a particular shape of spoon with which to extract the marrow, yet it is seriously argued that man in a cultural state such as indicated, had not learned the art of rubbing one stone against another in order to give it a cutting edge, but did rub one piece of ivory on a stone to smooth it for the reception of an engraving on it of a mastodon. Ivory is little at all softer than certain of the stones from which the so-called Neolith was often made. My experiments and my reason and every hour's work I have done, convince me that with our *present* data no one has the right to divide the stone age into a chipped and polished age, much less to divide the chipped age as has been done. The argument has no reliable evidence to support it.

I am sure I will be judged leniently when I claim that an intelligent study of archeology depends for its value upon some different classification than now sustains it.

Whether such classification can be made upon some such basis as was laid down twenty years ago by Prof. Otis T. Mason, or (if the classification is to be confined to stone implements alone,) whether that of DeMortillet or of Holmes will develop in the most valuable hypothesis, I cannot say. I am inclined, however, to believe in that of the latter, if there be added to it an arrangement to study the handles of implements, the development of attachment of the same, and the rapidity with which they may be worked, for the working part of most implements show little change in form from the earliest known.

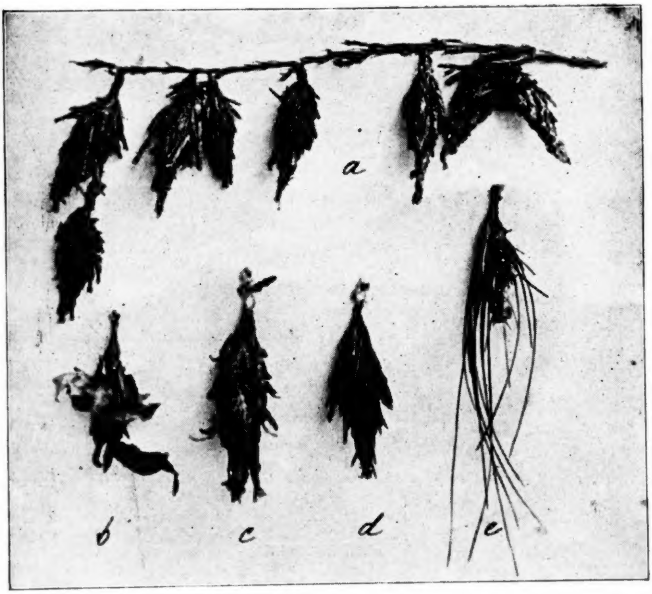
J. D. McGuire.[2]

Professor W. Boyd Dawkins on Paleolithic Man in Europe.—How much Prehistoric Archeology leans upon Paleontology has recently been shown by Prof. W. Boyd Dawkins (Journal of the Anth. Inst. of Grt. Britain and Ireland, Feb., 1894, p. 242) in a comparison, by fossils and human remains, of the two great divisions of prehistoric time in Europe. He thus compares them:

(a) The earlier period, called *Paleolithic*, now cold, now hot, of the Hippopotamus, Mammoth, Rhinoceros, Musk Ox, Reindeer, Cave Hyena, Cave Lion and Cave Bear, with man a nomad hunter lacking all domestic animals, who chipped but could not polish stone, and

[2] Of the Smithsonian Institution, Washington, D. C.

PLATE XI.



Bag-worm cases on various trees.

PLATE XII.

Elm with bark removed, showing injury by borers.

(b) The later time, called *Neolithic*, of still existing species and climate, with man an agriculturist possessor of the dog, goat and hog, who chipped and could also polish stone and make pottery.

Prof. Dawkins passes by the questioner who might here ask whether the first described man was really paleolithic, and accepts without hesitation the two custom honored titles, Paleolithic and Neolithic, as labels for his paleontological periods.

But if M. Dupont found the celebrated earthen bowl along with boar, horse, urus, chamois, goat, wildcat, hare, beaver, and reindeer bones, in the Trou du Frontal (on the Lesse near Furfooz) and at the Engis Cave (near Liege), a potsherd at the same spot where Dr. Schmerling had found his "Philosopher's" skull along with Mammoth, horse, hyena and bear bones in 1833; and if a bit of pottery was really found in the layer of cave bear, cave lion, rhinoceros, hyena, bison and mammoth bones, at Surignac Cave (Haute Garrone, France), after a farmer named Bonnemaison had mixed up the layers and lost the human bones; if pottery was found in the alleged paleolithic caves of Nabrigas (Prof. Joly), Vergisson (M. Fery), and Trou Rosette; and if MM. de Puydt and Lohest found three burned potsherds about nine feet down in the La Biche aux Roches Cave (near Spy, Belgium), under elephant and rhinoceros bones; then the word paleolithic, devised to signify an early non-pottery-making, non-stone-polishing stage of human culture, would lose mnch of its meaning.

Sir John Lubbock, when called upon to defend his word and its notion that man chipped a long time before he polished stone, cannot look for support to the flaking Australians, who, in the Kamalarai Country, used a ledge of sandstone rock as an axe polisher (Frazer's Aborigines of New South Wales, Sydney, p. 76) and often ground tomahawks and grooved axes (Brough Smith's Aborigines of Victoria, 1, p. 366, figs. 177, 178, 183, 189); though he may, it seems, look to the recently (about 1850) extinct Tasmanians, who never appear to have polished or got beyond chipping stone tools that resemble what M. de Mortillet calls Mousterian flakes.

It is the paradoxical mixing of the fauna of the above named earlier or paleolithic time in Europe that chiefly interests Prof. Dawkins and would call for such explanations as alternate periods of heat and cold, as hippopotamus and reindeer migrations, and as the preservation of animal carcasses in ice as food for later carnivora; to account for certain caves where, to the confusion of the naturalist, the bones of the boreal Mammoth and tropical Hippotamus are mixed together,

and heat loving spotted hyenas have gnawed the fresh bones of the arctic reindeer.

Puzzles like these may be finally explained by the study of such superposed plistocene layers as those of Abbeville, which, according to M. G. d'Ault du Mesnil, indicate that the fauna grew newer and a warm climate became colder as we approach the latest bed, as follows:

SOMME GRAVELS, ABBEVILLE.

(a) UPPER TERRACE (oldest).

Elephas antiquus, E. primigenius, Rhinoceros merkii, R. tichorinus, Hippopotamus major, Ursus speleus, Cervus megacerus, Hyena spelœa, Machærodus cultridens, Trogontherium cuvieri, Equus caballus, Bos primigenius.

(b) MIDDLE TERRACE.

Elephas antiquus (declining), *E. primigenius, R. tichorninus* (increasing), *Equus caballus, Cervus elaphus, Bison priscus, Rhinocerus merkii* (declining), *Hippopotamus major, Ursus spelœus, Cervus megaceros, Hyæna spelœa, Machærodus cultridens, Trogontherium cuvieri, Equus caballus, Bos primigenius.*

(c) LOWER TERRACE (latest).

Elephas primigenius, Equus caballus (dominant), *Rhinocerus tichorinus* (numerous), Reindeer, *Cervus elephus, Cervus tarandus, Bos primigenius,* Ursus (not determined) and *Cyrena fluminalis.*

Turning to the associated human remains, in Prof. Dawkins' first period, cave runs into cave and rock shelter into Drift so unclassifiably that we had better, he thinks, stop subdividing the epoch into Drift, Mousterian, Solutrian and Magdalenian, and call it all by one name, Paleolithic.

But while objecting to breaks in his Paleolithic, the sharp break between it and the Neolithic is his main point. As no grading together of fossil remains bridges over this gulf, so, he thinks, (spite of pottery rumors from paleolithic caves) that the human relics of period a, and period b, show a corresponding hiatus.

The few Drift-like chipped blades, produced at the Institute meeting from the (period b) Cissbury neolithic quarry were easily explainable as inchoate celts and wastrels, and the fact of their looking like (period a) Drift specimens was enough to call a halt to the surface gatherer and the labeller by type and, we might add, clear the

museums of Europe of many hastily classified "paleoliths." Perhaps this was the same kind of Drift likeness that I had observed in April, 1893, among the ruder incipient forms at the (period b) Neolithic quarry of Spiennes in Belgium (The Archæologist, July, 1893. AM. NATURALIST, Nov., 1893). But at Spiennes as at all other quarries that I have studied and mutually compared, it is evident that the *results* of each blade maker's workshop, by which alone we can explain the wastrels, must be first understood. Whatever the similarity between Neolithic Cissbury and the paleolithic Drift (and the British Museum specimens show none) neolithic Spiennes does not come much nearer the paleolithic drift workshop of Abbeville, through the similarity of rudest wasters in either case, than it does to Flint Ridge, Ohio.

If Prof. Dawkins recognizes no human chipped implement grading out of his Paleolithic period, so he will not with Prof. Prestwich allow the work of a more primitive alleged predecessor of the Drift man to grade into it, holding that the variously nicked flints "Plateau implements" found by Mr. B. Harrison on the high Kentish downs are of Drift and not pre-Drift age. But he does not clearly say whether he thinks that these curious specimens are blade refuse, finished implements or, as Mr. W. G. Smith of Dunstable (who writes me that he has found many in the Drift-blade bearing gravels at Caddington) regards them, the work of nature.

Prof. Dawkins showed also at the meeting a good example of a modern "paleolith," a North American Indian soapstone quarry pick, and with it a stone tool very modern yet simpler in form than any paleolith, one of Dr. Leidy's much ignored and often misunderstood "teshoas," seen used by Utes, together with a set of Trenton specimens obtained by Prof. Dawkins and which he said should, with their fellows collected by Dr. Abbott and Professors Putnam, Haynes, Morse, Carr, and Shaler, be placed, until further proof be furnished, in a suspense account.—H. C. MERCER.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

National Academy of Sciences.—This body met in Washington, D. C., April 17th. The following papers were read. I. Histological Characteristics of Certain Alpine Plants, G. L. Goodale. II. Corrosions by Roots, G. L. Goodale. III. An Investigation of the Aberration and Atmospheric Refraction of Light, with a Modified Form of the Loewy Prism Apparatus, George C. Comstock (Presented by S. Newcomb). IV. Biographical Memoir of John Le Conte, Joseph Le Conte. V. The Coral Reefs of the Bermudas, A. Agassiz. VI. The So-called Serpulæ Reefs of the Bermudas, A. Agassiz. VII. The Bathymetrical Extension of the Pelagic Fauna, A. Agassiz. VIII. New Method of Determining the Relative Affinities of Certain Acids, M. Carey Lea. IX. On the Change of Young's Modulus of Elasticity with Variation of Temperature, as Determined by the Transverse Vibration of Bars of Various Temperatures, A. M. Mayer. X. On the Production of Beats and Beat-tones by the Covibration of two sounds, so high in pitch, that when separately sounded they are inaudible, A. M. Mayer. XI. On the Motions of Resonators and Other Bodies Caused by Sound Vibrations, with Experimental Illustrations; also a Reclamation, A. M. Mayer. XII. On Late Researches on the Variation of Latitude, S. C. Chandler. XIII. On the Infra-red Spectrum, S. P. Langley. XIV. The Bacteria of River Water, J. S. Billings. XV. The Influence of Light Upon the Bacillus of Typhoid, and the Colon Bacillus, J. S. Billings. XVI. Recent Gravity Instruments and Results, T. C. Mendenhall. XVII. The Geographical Distribution of Fishes, Theo. Gill. XVIII. Note on a Possible Increase in the Ultimate Defining Power of the Microscope, C. S. Hastings. XIX. The Internal Energy of the Wind, S. P. Langley.

No election of members was had. The Academy discussed a plan of division into classes without reaching a definite conclusion.

Natural Science Association of Staten Island, Februry 10, 1894.—Mr. William T. Davis exhibited specimens of the seventeen year locust found in various years since 1877, and read the following paper.

THE SEVENTEEN YEAR LOCUST ON STATEN ISLAND.

Our island will resound with the rattling song of the seventeen year Harvest fly or "Locust," during the latter part of next May and in

the month of June, and it may not be uninteresting in view of the fact, to give a short account of the species in connection with this locality. It must be borne in mind that while *Cicada septendecim* Linn. appears at intervals of seventeen years, its advent is not in the same year in all of the middle states, or in all the counties of this State, but that there are separate broods or colonies, that emerge in great numbers in districts of varying extent, the limits of which are not sharp or well defined. Thus it happens that while there is a certain brood that appears periodically on our island, and attracts at such times general attention, there are also other years when the *Cicada* occurs in small numbers. At such times it will often be found that a brood is emerging not many miles away, and that the island lies within the outer margin of the territory.

This matter of distribution and much more regarding the seventeen year *Cicada*, and the more southern thirteen year form, has been recorded by Professor Riley in Bulletin No. 8 of the U. S. Department of Agriculture, Division of Entomology. Professor J. A. Lintner, New York State Entomologist, also gives, in his second annual report, the distribution of the *Cicada* in this State, noting five broods as occurring within its limits.

In 1826 this *Cicada* appeared in great numbers on the island, as I have been informed by my grandmother; in 1843 they came again, as recorded by Thoreau, and still again in 1860 and in 1877. In the latter year I saw many tree trunks and fences brown with their cast pupa skins, and the whir of their flight and monotonous song, could be heard in every direction. Dr. Fitch, in 1855, wrote of the seventeen year *Cicada* and records this brood as inhabiting the valley of the Hudson River. Since his time, the various broods in different parts of the country, have been numbered for convenience, and the one inhabiting the valley of the Hudson and Staten Island, is known as No. XII.

During the visitation of 1877, I noticed that many of the *Cicadas* were affected by the singular fungus *Massospora cicadina* Peck. While the insects were alive and walking about the fences and the tree trunks, if the abdomens of the infected individuals were suddenly jarred, they gave forth a cloud of innumerable spores. It has been stated that only injured specimens are attacked by this fungus, and then only toward the latter part of the season.

Since 1877, the seventeen year *Cicada* has not appeared on the Island in great numbers, and probably but few have been noticed except by those who have looked for them. The facts connected with

appearance, as far as known to me, may be arranged chronologically as follows:

1881, BROOD XVIII.

While collecting insects with Mr. Leng in the neighborhood of Watchogue, we found a red-eyed *Cicada* pupa under a stone, and on the 5th of June, eight specimens were collected, many of them being wet, having but recently emerged. By the 12th of June, they had become quite numerous, and I counted about one tree near Silver Lake, fifty-two pupa skins. The brood to which these insects belonged does not appear in great numbers in the east, but is mainly located in Wisconsin and the neighboring States. Staten Island, Essex Co., New Jersey, and Germantown, Penna., were apparently, the only eastern localities from which the insect was reported in 1881.

1885, BROOD XXII.

I made special search this year for the Periodical *Cicada*, as one of the most widely extended broods known, was to make its appearance. On the western end of Long Island in the neighborhood of Brooklyn, they came in some numbers, and also sparingly in New Jersey, the main body in the east, however, occuring in Pennsylvania and thence southwestward.

On the Island the insects must have been quite scarce. Mr. James Raymond and I, were walking along a wood-path in the Clove Valley on the 4th of July, when we found a wing that probably some bird had pulled off a red-eyed *Cicada*, as they so often do. To those who are acquainted with the character of the wings of this insect, their colors etc., this will constitute ample authority for its presence. In the autumn, an old pupa skin was collected, and the following April, another was found at South Amboy, New Jersey.

1888.

On the 16th of June while in the valley of Logan's Spring Brook I heard a *z-ing* in the distance like that produced by the seventeen year *Cicada*. As it stopped shortly and was not repeated the search was abandoned. Eight days later, when by the same brook the song was again heard, and this time followed to apparently the same tree from whence it came on the previous occasion. After some search the insect was detected on the under side of the limb, and captured. One of its fore wings was deformed so that it was unable to fly, and of course must have been born in the immediate vicinity. This was the only individual seen during this year.

1889.

Brood No. VIII was expected to appear in southern Massachusetts, on Long Island and in parts of Pennsylvania and West Virginia in the summer of 1889. It returned, according to a note in Vol. 1, No. 4, of the Proceedings of the Entomological Society of Washington, in considerable numbers in parts of North Carolina and West Virginia, and in less numbers in the District of Columbia, Maryland and New Jersey.

The only evidence that the seventeen year *Cicada* occurred on Staten Island in 1889, consists of a pupa skin found on a grass stem during the summer by Mr. Jos. C. Thompson, and kindly given to me.

1890.

During this year the *Cicada* was not expected to occur in any part of the country. In June and July, I found in a garden in New Brighton, three pupa skins, and my sister discovered one of the perfect insects on the trunk of a pear tree, but it was unfortunately destroyed by the family cat. Mr. Leng also found a red-eyed *Cicada* on an apple tree near the Moravian Cemetery, while he was "beating" for Longicorns.

On the 8th of September 1890, I found, in a hill of potatoes, a live red-eyed *Cicada* pupa, which I endeavored to rear, but without success.

1892.

On June 5th, I heard a seventeen year *Cicada* at West New Brighton, and the next day Mr. Leng's children caught me a specimen, and a few days later a second example. On the 11th of June there were many of the *Cicadas* singing in the high trees about Logan's Spring Brook, and on the 12th, I heard one near Rossville.

1893.

On June 11th, the *Cicadas* were fairly numerous in the woods along Willow Brook, and later in the month I heard them along Logan's Spring Brook. Mr. Leng's children also gave me two specimens from his garden at West New Brighton.

It is well-known that a few seventeen year *Cicadas* often make their appearance in the year previous to their general visitation, so that those collected in 1893, and even in 1892, may have been precursors of the general swarm which is to come early next summer, that is, seventeen years from the visitation of May and June, 1877.

March 10.—Mr. L. P. Gratacap exhibited pieces of a drift bowlder containing fossils, and read the following paper:

ADDITIONS TO THE DRIFT FOSSILS OF STATEN ISLAND.

These specimens represent the remainder of one of the bowlders found by Mr. Arthur Hollick, at Prince's Bay, last autumn, mentioned in our Proceedings for Nov. 11, 1893.

The rock is a lower Helderberg limestone, somewhat crystalline and shaly, and affords numerous fossils, conspicuous among which is *Strophеodonta varistriata* var. *arata* Hall, a fossil brachiopod characterized by a very convex ventral valve and by prominent ribs, which are scored by numerous delicate striae, easily discernible under a low magnifying power. This fossil assumes some importance, in its numerical representation, in the lower Helderberg beds of Becraft's Mountain, east of the Hudson River, in Columbia Co., and the most easterly exposure of the Helderberg series of strata in New York State. It seems safe, from this fact, and a close lithological similarity in the material of the bowlders with the Becraft stone, to conclude that this "wanderer" commenced its travels southward from that distant point. Associated with it are a few lamellibranchs, which are seen less commonly in our drift material, and were actually less important elements in the Helderberg Sea. These are *Pterinea communis* Hall, *Pterinopecten bellula* Hall, and *Aviculopecten umbonata* Hall, all new to the Island. Upon one of these *Pterina communis* there is the half effaced trace of a pygidium or tail of *Lichas bigsbyi* Hall, a trilobite and a not common species, usually found in separated heads and tails. Its identification as *Lichas* is unquestionable, but in the complete absence of any considerable evidence, from the poor nature of the specimen, it is not certainly separated from *L. pustulosus*. If *bigsbyi*, as is probable, it also indicates Becraft's Mountain as its origin. Amongst the brachiopodous remains in these fragments we find *Rensselæria mutabilis* Hall, *Meristella bella* Hall, and *Orthis eminens* Hall, all new in our Island finds. Besides these molluscs there are seen, in these fossil remains, plain and broad sheets, or fronds, of the bryozoan *Lichenalia*, showing both the poriferous and non-poriferous surfaces. The species I am unable at once to determine. Besides this there is a fenestrated polyzoan, *Fenestella œsyle* Hall, as far as I can fix on its specific nature. The heteropod *Platyceras gebhardii* Hall is another new species, although this reference may be doubtful, as in this genus of shells the species run insensibly into each other and the present multiplication of these specific names seems provisional.

Amongst these specimens are two Oriskany sandstone species, *Rensselæria ovalis* and *Platyceras nodosus*, which were detached by Mr. Hollick from the same bowlder which yielded the Helderberg fossils. This places the rock in the upper Lower Helderberg strata, probably the Upper Pentamerus beds, and exhibits the faunal emergence of the life of the Oriskany Ocean. This find illustrates still further, if illustration was necessary, the paleontological importance of our drift material and provides additional incentives to further investigation.

Mr. Thomas Craig exhibited a living myxomycete under the microscope and read the following paper:

SOME OBSERVATIONS ON THE BEHAVIOUR OF A MYXOMYCETE.

In Bennett and Murray's book on Cryptogamic Botany mention is made of this form of life as the sixth sub-division. It is placed between the fungi and the protophyta; but at the end of their description they say: "We are justified in placing these organisms outside the limits of the vegetable kingdom."

Dallinger, in his edition of Carpenter on the Microscope, places them in the animal kingdom, in close affinity with the rhizopods. Saville Kent, after prolonged investigation placed them in the animal kingdom. All these writers follow DeBary, who in 1859 first published the result of his researches, and his conclusions that they were more nearly allied to animals than plants. DeBary's conclusions were fully confirmed by Saville Kent, who traces the development as follows: Suppose the existence of a sporangium; this bursts and liberates the spores which in presence of water give birth to a globular protoplasmic body, which becomes after a time a flagellate infusorian, capable of ingesting solid food. It then loses its flagellæ and becomes an *Amœba*. Two of these conjugate and attract a number of other like bodies, or become joined to them in some way not understood. These form what is known as a plasmodium, a portion of which I exhibit under the microscope. This plasmodium is capable of apparently voluntary motion. It goes forward and retreats by a flowing motion, carrying embedded in its substance various species of algae which it has captured as food. There is a remarkable resemblance in the mode of movement between the myxomycetes and the proteomyxa. The same flowing motion of the protoplasm and the joining of the filaments to form larger ones.

The reason for the foregoing prelude is that during the month of February I have been watching one of the myxomycetes—which has developed in some water taken from the Old Town pond—into what

may be called its animal stage. In the glass jar in which it is growing it resembles a miniature tree of many branches, flattened against the glass. Before it made its appearance the glass jar was so covered with growth of algae that one could not see through it. As soon as the myxomycete made its appearance and had travelled a short distance, the glass on that part over which it passed was comparatively clear. Now that the myxomycete has gone several times round the jar, the glass is quite transparent. I took some measurements of its rate of progress.

On Feb. 26, from 2.15 p. m. to 8.45 p. m. it had travelled 1¼ inches.

Feb. 27, at 9 p. m. the distance covered was 6½ inches.

Feb. 28, a 9 p. m. 10¼ inches.

March 1, at 9 p. m. 15¼ inches.

So you will observe the rate of progress is not uniform, but the average rate of progress was 5-26ths inch per hour. A curious circumstance is that while the plant life disappears in all parts of the glass over which the myxomycete moves, it does not seem to interfere with the animal life on the glass. There are a large number of the brown *Hydra* and numerous small worms, which do not appear to be affected in any way, although they are surrounded by the plasmodium of the myxomycete.

I have not been able to definitely name the species, owing to the absence of the sporangium, but from figures I have seen it resembles *Didymium serpula*. Of course in the foregoing there is nothing very new, but having been fortunate enough to get so fine an example, so favorably located for examination, I thought it might interest some of the members to see under the microscope, an object about which so many diverse views have been held by botanists and zoologists. Apparently the only reason for the botanical claim to it is the fact that in its reproductive stage it forms sporangia like some of the fungi, while on the other hand, from its first appearance in the water or in damp places it acts precisely like an animal in its mode of progress and its way of taking in and digesting solid foods.

MISCELLANEOUS MATERIAL EXHIBITED.

Mr. L. W. Freeman presented a mastodon's tooth, obtained from Staten Island Sound by Mr. Seeley Van Pelt, while tonging for oysters. Its value was not understood by the finder, who allowed it to be thrown away with the refuse oyster shells, into Old Place Creek, from whencc it was recovered by Mr. Freeman.

Boston Society of Natural History, March 7.—The following papers were read: Mr. F. P. Gulliver, The Newtonville sand plain; Mr. J. B. Woodworth, Some typical eskers of southern New England.

April 4th.—The following paper was read. Prof. F. W. Putnam: The department of ethnology at the World's Columbian Exposition.

SAMUEL HENSHAW, *Secretary.*

The Biological Society of Washington, March 10.—The following communications were read: Mr. C. H. Townsend, The Ornithology of Cocos Island in its Relation to that of the Galapagos Archipelago; Mr. B. T. Galloway, A Hexenbesen of *Rubus*: Mr. M. B. Waite, The Hexenbesens of Washington and Vicinity. Illustrated with lantern slides.

March 24.—The following communications were read: Dr. Theobald Smith, On the Significance of Variation among Species of Pathagenic Bacteria; Mr. Vernon Bailey, On some Bones from a Cave in Arizona; Mr. C. D. Walcott, On some Appendages of the Trilobite; On the Occurrence of Fossil Medusæ in the Middle Cambrian Terrane.

April 7.—The following subject was discussed. What is a Living Cell?

FREDERIC A. LUCAS, *Secretary.*

SCIENTIFIC NEWS.

Agriochœrus and Artionyx.—Mr. Hatcher has lately collected and sent to me from the White River bad lands of South Dakota a number of specimens of the genus *Agriochœrus* Leidy. This material demonstrates the fact that the genus *Artionyx* of Osborn and Wortman is a synonym of *Agriochœrus* and very probably, that the specimens which I described under the name of ? *Mesonyx dakotensis* from the same horizon, should be referred to the same or to some closely allied animal. A description of this extraordinary type will very soon be published. W. B. SCOTT.

The Haeckel Celebration.—On the 16th of February, Ernst Haeckel completed the sixtieth year of his life. On the 17th, the little town of Jena, in whose University Haeckel is Professor of Zoology, was thronged by a great crowd of his friends, pupils and admirers, among whom may be specially mentioned the Hertwigs (Oscar and Richard), Waldeyer, Arnold Lang and Hermann Credner, besides many well known professors of Jena itself. The chief ceremony of the day was the uncovering of the marble bust of the great scientific worker and writer, from the chisel of the eminent sulptor, Professor Kopf of Rome. At noon the lecture-theatre of the Zoological Institute, in which the greater part of Haeckel's life work has been carried on, was crammed from floor to ceiling, and Professor R. Hertwig, of Munich, the pupil, friend and colleague of Haeckel, was called upon to unveil the bust. In an admirably-worded speech be alluded to the main facts of Haeckel's life, and especially to his labors in the cause of science and scientific freedom. The unveiling of the striking bust was the signal of a great outburst of applause, and when this had subsided, a deputation from some societies, the Medicinishe-naturwissenschaftliche Gesellschaft of Jena and the Geographische Gesellschaft of Thüringen, offered to Professor Haeckel their honorary membership. They were followed by a deputation from the students, who expressed in enthusiastic terms their admiration and respect for the Professor of Zoology. Professor Max Fürbringer of Jena followed with details concerning the subscription to the bust, informing us that there had been nearly 700 subscribers, who sent their tokens of appreciation from all parts of the world; he especially alluded to the gratifying fact that many subscriptions had come from France. As a consequence of this, the total

amount exceeded the cost of the bust by at least £300, and this sum he had pleasure in placing in the hands of Professor Haeckel, for him to devote to such purpose as he might think best in the interests of science.

After the ceremony, and after Professor Haeckel had, not without emotion, acknowledged the honors showered upon him, the elect among the visitors adjourned to a banquet in the Hotel Zum Bären, where covers were laid for about 120 of both sexes. The day concluded with the characteristic German institution, a "Commers," in which almost all the students in Jena seemed to be taking part. Cheers for the Professor, songs and speeches in his honor, mingled with the clinking of glasses, enlivened the old university till a late hour at night.—*Natural Science*, March.

Mr. Henry O. Forbes, well known for his interesting account of his travels through the Eastern Archipelago, has been appointed Curator of the Liverpool Museum.

Dr. J. Boehm, the botanist, of Vienna, is dead at the age of 62.

Richard Spruce, the botanist, died at Coneysthorpe, England, Dec. 29, 1893, at the age of 76. He traveled extensively in his younger years and accumulated one of the most valuable herbaria in England; he also published numerous botanical papers, but he will longest be known from his successful efforts in introducing the Cinchona plants into India.

Dr. Friedrich Zschokke has been made ordinary professor of zoology in the University of Basel, in the place of Prof. Dr. L. Rütimeyer retired.

Dr. J. Vosseler, formerly of Tübiugen is privat-docent of Zoology in the technical high school of Stuttgart.

Dr. W. Migula, formerly docent, has been made Professor of Botany and Bacteriology in the technical high school at Karlsruhe.

Dr. Saposchnikoff has become Professor of Botany at the University of Tomsk, Siberia.

Mr. R. T. Günther is to be science tutor in the Magdalen College, Oxford.

The library of the late Prof. A. Milnes Marshall has been given to Owens College, Manchester, by his friends and executors.

The Sixth Geological Congress will meet in Zürich from August 20 to September 2, 1894.

Dr. Justus Karl Hasskarl, the botanist, who introduced the cultivation of Cinchona into Java, died at Cher, Prussia, Jan. 5, 1894.

Edmond Frémy, Director of the Museum of Natural History at Paris, is dead.

Alexander Theodor von Middendorf, the Arctic explorer, died Jan. 28, 1894. He was born in St. Petersburg in 1815.

Dr. K. Zelinka of Graz has been appointed extraordinary professor of zoology in the University of Vienna.

The list of literature in the current volume of the "Zoologischer Anzeiger" has been greatly improved, not only by being brought out more promptly than heretofore but by the addition of abstracts of a few lines stating the substance of the article. It may be that editors and publishers were spurred up to this by the announcement of the "Zoologisches Centralblatt," the first number of which bears date Feby. 1, 1894. This new publication is designed to furnish abstracts of the principal articles at the earliest possible moment. It is edited by Dr. A. Schuberg of Karlsruhe, with the assistance of Professors Bütschli of Heidelberg and Hatschek of Prag. The first number, containing 40 pages, is not remarkably strong.

The San Francisco Microscopical Society extends a cordial invitation to those interested in microscopy to visit its rooms, 432 Montgomery St., San Francisco, Cal., and to attend its meetings the first and third Wednesday of each month. The officers for 1894–95 are Prof. W. E. Ritter, president; W. E. Loy, vice-president; F. E. Crofts, recording secretary; G. O. Mitchell, corresponding secretary; C. C. Riedy, treasurer.

The following is the list of officers of the Zoological Society of Philadelphia: President, Charles Platt; Vice-president, J. Vaughn Merrick; Corresponding Secretary, Prof. H. C. Chapman; Treasurer, William Hacker; Directors, W. H. Merrick, I. J. Wistar, C. W. Trotter, F. S. Fassitt, G. C. Morris, F. W. Lewis, M. D., C. M. Lea,

C. C. Febinger, D. S. Sellers, S. G. Dixon, M. D., J. B. Henry, J. B. Leonard.

Hon. Walter Rothschild proposes to publish a periodical in connection with his museum at Tring, under the title of "Novitates Zoologicæ." It will contain papers on mammals, birds, etc., and also discussions on questions of zoological or paleontological interest. Descriptions of new species will be confined almost entirely to those of which the types belong to the Tring Museum, and the other articles will, for the most part, be founded on work carried on at that museum or on specimens sent by Mr. Rothschild's collectors.

From the March number of *Forest and Stream* we learn that the buffalo in Yellowstone Park are again being harassed by hunters. A year ago this winter several buffalo were killed; last spring and the spring before, a number of calves were captured; this winter ten buffalo have been slaughtered at a single killing. At this rate it will not be long before the last shall have been shot down. It is for the people to say whether or not they desire this.

Dr. Robert Lamborn has presented a valuable library of archeology to the University of Pennsylvania.

The Zoological Garden of Philadelphia purchased the orang-outang which was on exhibition in the Javanese Village at Chicago. It is a very intelligent and cheerful animal. Subsequently it acquired a pair of Cheetahs, and the rare *Felis egra* and *F. jaguarondi* from Mexico.

Extracts from examination papers: "The meganucleus breaks up, the micronucleus breaks down." "I don't quite understand the difference between Bacterier and posterior."